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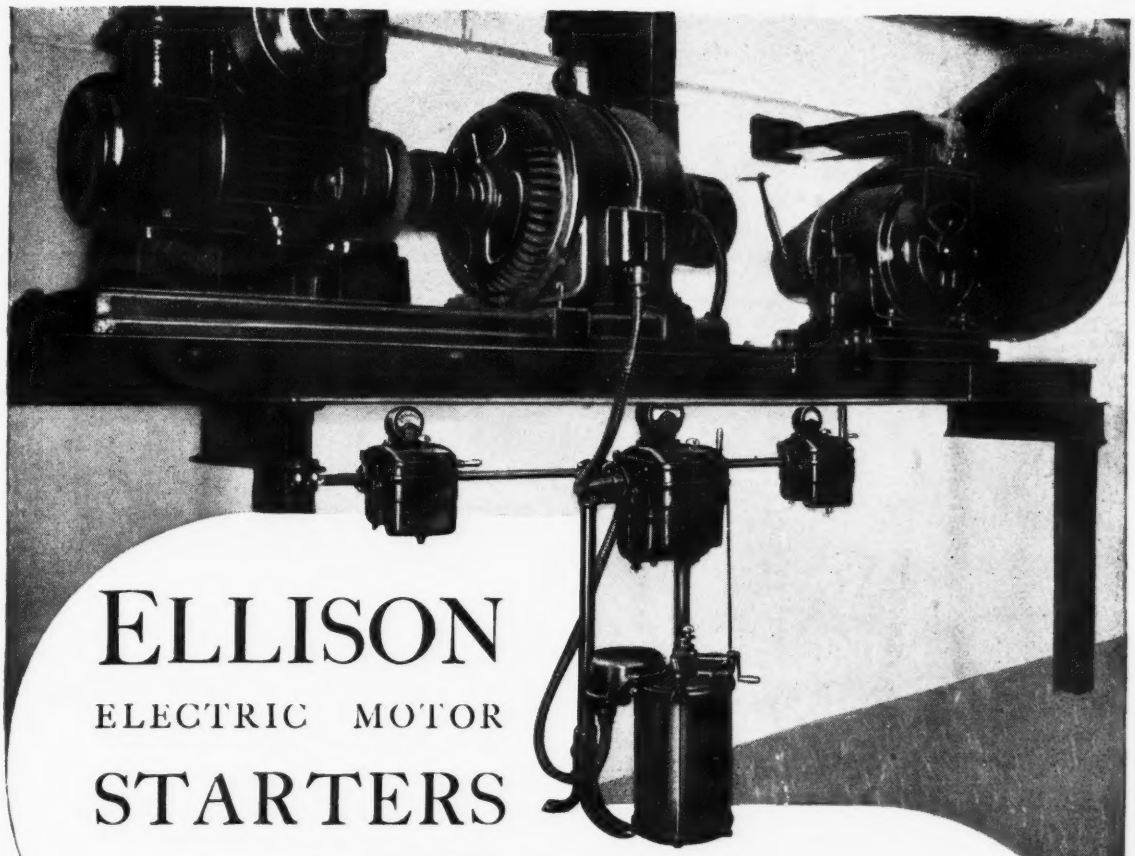

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THE
ELECTRICAL REVIEW

Volume CXXVIII No. 3294

Friday, January 10th, 1941

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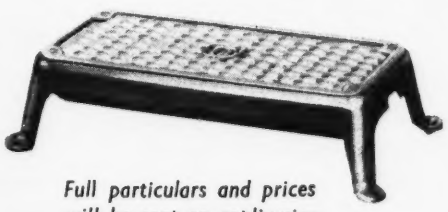

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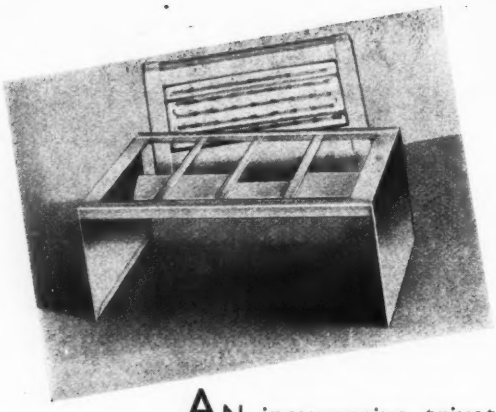

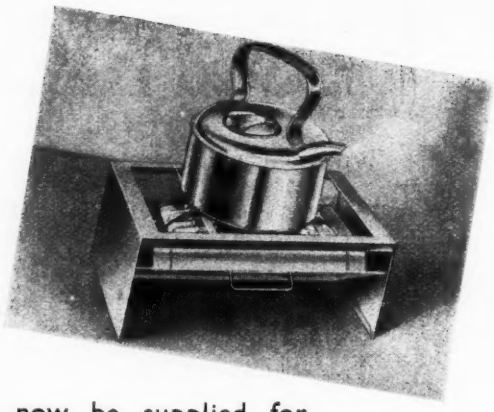

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THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVIII. No. 3294 JANUARY 10, 1941 Price SIXPENCE

Fires and Air Attack

Means of Minimising Risks

IN normal times damage to electrical apparatus or interruptions in the supply of electricity as a result of fire usually originate in breakdowns of insulation. These breakdowns are of two kinds. The first is a consequence of faults in material or in design, construction or maintenance. For the second, external agencies, e.g., surges due to lightning (exaggerated possibly by the first) are responsible.

The best way of minimising such failures would, of course, be to tackle the causes at the source, but much that would be possible in this way is impracticable either on engineering or commercial grounds. Complete immunity from trouble, therefore, cannot be expected and a second line of defence is found in promptly disconnecting faulty apparatus. Protective gear may not always be rapid enough in operation, however, to prevent arcing that is sustained long enough to start a fire. Also it has itself been put out of action at critical moments owing to the burning out of nearby plant units. There is also the position to consider that bus zones of few generating stations or sub-stations are included in protective systems for fear of unnecessary tripping of circuit-breakers.

Insulation Problems

Unfortunately most insulating media are supporters of combustion, and while something has been done to reduce the effects of this characteristic by such means as reducing the oil content of switchgear, substituting chlorinated diphenyl for transformer oil and employing fire-resisting covering for cable conductors, the scope of such alternatives is confined to certain well-defined applications.

Failing ability to prevent faults developing, it becomes of vital importance to see that the fire does not spread to healthy apparatus. This involves consideration of methods of rapidly extinguishing the conflagration—a subject which has been investigated by the Electrical Research Association with results that provided the theme of an I.E.E. paper last session.

So far the question of fire hazards has been regarded from the angle of inevitable, or almost inevitable, accident. How far are the recommendations made nearly three years ago by the Fire Risks Committee of the Electricity Commissioners applicable to the protection of generating stations and substations against enemy action? Although air-raid precautions have a wider scope than those required for dealing with fire alone, it can be said that the spreading of fire is the principle risk to plant that must readily be mitigated. While inherent qualities of construction and maintenance may not safeguard plant, cables and buildings from the bomber, the same principles as in peacetime hold good in preventing the spread of fire.

Sectionalising Plant

The outstanding importance of segregation and physical separation of plant items was emphasised by Mr. F. H. Sharpe, who dealt with the war aspect in our issue of December 27th. From his survey of the situation the conclusion is to be drawn that what is recognised as good practice in one case will prove to be so in the other also, with minor exceptions such as the roofing-in of open-air transformer bays, although even that may in some instances serve a useful purpose in reducing the amount of noise emitted.

In publishing the report of the Fire Risks Committee, the Commissioners urged undertakings to adopt such of the precautions recommended as were "reasonably practicable" in each case. While new generating stations and major sub-stations would naturally be designed in accordance with these recommendations, the owners of plant already in existence could not be expected to be so thorough-going in their compliance. It was, for them, a matter of assessing risks, "a nicely calculated less or more." Now the risks are much greater and commercial considerations are not overriding ones. We know, too, that money spent on defence will not in this case provide us with an unwanted asset at the end of the war, but will leave us with a public supply system from which certain, otherwise almost unavoidable, defects have been eliminated as regards its older but still serviceable components.

New Year Honours

THE electrical and associated professions are perhaps rather better represented than usual in the lengthy list of New Year Honours published last week; about thirty names may be included in this category and will be found in the "Personal" page of this issue. Among the new knights are Mr. P. Bennett (Joseph Lucas, Ltd.), who has been much in the news lately; Professor W. L. Bragg, whose distinguished father received the accolade some years ago for his work as a physicist; and Dr. E. V. Appleton, secretary to the Committee of the Privy Council for Scientific and Industrial Research. Mr. R. T. G. French has undoubtedly earned his promotion in the Order of the British Empire for his work as secretary of the Electricity Commission and the same can be said of Mr. G. E. Bailey (Metropolitan-Vickers) who also becomes a C.B.E. Electrical manufacturers are also honoured in the person of Mr. W. A. Harriman, of Reyrolles (M.B.E.), while the M.B.E. of Mr. J. Aspinall (Hick, Hargreaves) may be regarded in a similar, if somewhat indirect, light. A number of telephone engineers receive recognition for the strenuous work which has fallen to their lot by reason of the war. Mr. J. S. Pringle, Director of Electrical Engineering at the Admiralty, who has been made a C.B., is another whose work has been intensified by war conditions.

Lamp Cap Salvage

IT has always seemed a pity that an electric lamp should be thrown away merely because the filament has failed and we recollect a venture some years ago for the repair or replacement of the wire: what became of it we cannot say. We suppose that many people have wondered at times why lamp manufacturers did not at least make an effort to recover the brass caps from their lamps and use them again. The truth is that in normal times the game is not worth the candle (to adopt a more or less fitting expression) as it is cheaper to provide entirely new caps. But now that all metals are precious and not too easily come by the case is altered and the E.L.M.A. companies are appealing for the return of the caps to their factories. We reproduce in this issue some advice on the method of "decapitation" which E.L.M.A. has circulated. As an inducement a sum of 10s. per thousand caps is being paid and, of course, the cost of carriage will be born by the lamp makers.

Voltage Ranges

IT is common for electricity supply engineers to refer to their 400-V systems as "low-voltage." Nevertheless, the B.S. Glossary and the various official regulations restrict the use of the term "low voltage" to circuits in which the voltage does not exceed 250 and define anything above this and up to 650 V as "medium voltage." While the colloquial reference is clear enough in its meaning usually, it is advisable in so exact an applied science as engineering to use words in accordance with exact definition, especially as considerations of safety may be involved in the differentiation between the two ranges. Another departure from present day approved practice is the habit of many engineers of continuing to distinguish between high-voltage (up to 3,000 V) and extra-high voltage (for anything higher). This was reasonable enough when the upper limit was 11 kV, but ceased to have any utility when it was extended to as much as 132 kV. The expression "extra-high voltage" was dropped from the Commissioners' Regulations when the old difference between it and "high voltage" with regard to permissible voltage variations ceased to be recognised for new bulk supplies.

Unnecessary Armouring

DURING the past few months the practice of armouring cables has been virtually banned by the Electricity Commissioners because the steel is needed for more urgent work. With the object of compensating for the consequent reduction in mechanical strength, many engineers have proposed to stiffen the lead covering by alloying it with antimony or with cadmium. By doing so a great part of the economy to be expected from dispensing with the armouring is lost, since the departure from standardised processes tends to raise the final price of the cable disproportionately. In this issue Mr. R. W. L. Phillips discusses the subject in the light of many years' experience of plain lead-covered cables at Bedford. It seems probable that armouring is of little advantage in many instances in which convention has hitherto decreed its use and that it then becomes only another of those superfluities that the present stringency has shown us we can very well do without.

Luminous Walls

TRANSLUCENT hollow bricks that admit daylight and contain gases and electrodes to act as electric discharge lamps during the dark hours are referred to in a recent number of *Science*. Such a system of illumination would appear to offer many advantages, including the avoidance of glare through the elimination of small sources of bright light. It is stated that the patents have been assigned to a well-known electrical manufacturing concern in the United States, and this would indicate that the special bricks are not of the "gold-brick" variety. Perhaps the main obstacle to developing the invention will prove to be that by the time it can be brought into commercial use the long-distance bomber will have introduced black-out difficulties to the American Continent.

Air Conditioning in Mines

LIMITING factors in working the gold mines on the Rand are the temperature and humidity of the air at deep levels. In one group of mines, according to the *South African Mining and Engineering Journal*, the present economic depth of 9,000 ft. could be extended to 13,000 ft. with general air cooling and under dry conditions. For another group it is estimated that every 1,000 ft. gained gives an additional life to the mines of at least four years. Air conditioning has proved very satisfactory in somewhat similar conditions in the United States. At a copper mine in Arizona 140-ton refrigerating units driven by 150-HP motors have been installed at three levels. The lowest is at 4,000 ft. (where the rock temperature reaches 140 deg. F.), but it is proposed to move the cooling coils down to as much as 1,000 ft. below the compressors as mining progresses. Since, even at present levels, work can be carried out in places where it would not otherwise have been possible, the introduction of air conditioning seems, as in so many other applications, to promise major advantages.

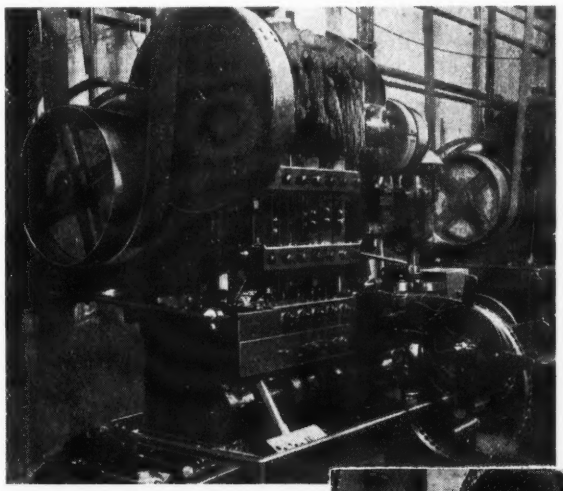
MASS PRODUCTION

Electricity Applied to the Manufacture of Fasteners

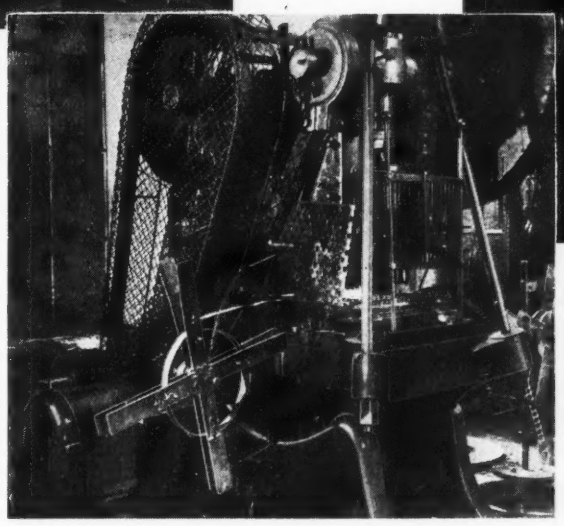
The production daily of several millions of small articles, often of intricate shapes, provides an interesting example of the versatility and adaptability of electricity, as well as its convenience and low cost

ONE of the best examples of mass production we have seen is that adopted for the manufacture of fasteners at the modernised works of the Carr Fastener Co., Ltd., at Stapleford. Zipp fasteners, snap, spring and clinch devices, clasps and eyes, turnbuttons, clamping gadgets, and so on, for clothes, boots, furnishings, motor cars—there seems to be no end to the list of different types of fasteners which are produced in the works. But the picture we had most clearly in our mind when we left the works after a recent visit was one of the large-scale handling and treatment of very small parts.

It is, of course, the enormous quantity of small parts handled which dictates such definite mass-production methods. On one floor alone about 16 million articles are blanked weekly. It is exceptional to see a part longer than an inch in its greatest dimension, and there are numerous pieces, many of ingenious and complicated construction, which, to say the least, must require reasonably good eyesight to permit of individual handling.



It would be expensive to bracket motors to machines such as the multiple-spindle eyelet machine on the left. Right: A machine for carrying out intricate filing and sawing operations; note the resistance welder on the left



Individual driving is adopted for machines such as this power press requiring low speeds and above 2 or 3 HP

Before one's mind turns from such large-scale quantity production to, say, the amount of metal involved (and even this is no mean figure) one is surprised at the comparative small power requirements. "Full out," the factory has a working load of about 250 kVA, represented by about 60 motors and some industrial heating. The motors vary in size from ¼ HP to 40 HP, but by far the majority of them are in the neighbourhood of 1 or 2 HP.

The main raw materials of the works are strip brass and steel, both of which are received in coil formation. The production of zipp fasteners is a speciality which is set apart from the main works mass-production processes and will be referred to later. For all the rest of the products there is a similarity of processes in the machine rooms which involve stamping blanks from the strip metal and forming the blanks into the required intricate shapes of the various components of the fasteners. Seldom, however, is an article considered so intricate as to involve the employment of more than one operational machine. Invariably the parts are blanked and formed from the strip by the agency of multiple die machines.

These multiple machines vary in size according to the size of the component and the final fastener, but in general the principle of operation is the same. Let us take as representative of this class of equipment a multiple-spindle eyelet machine. The strip is fed automatically and continuously beneath the first spindle which pierces out the blanks.

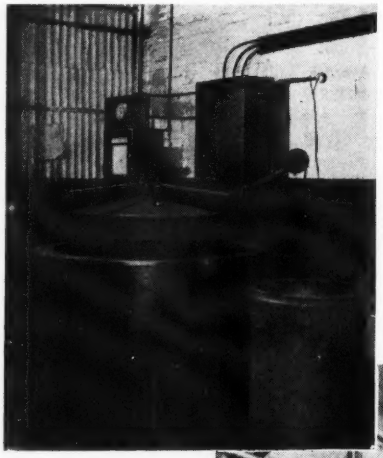
Each of the blanks thus produced is progressively passed, by means of a slide fitted with metal fingers, to the relative punches carried on cam-operated spindles, each of which imparts a partial shaping operation until, finally, under the last spindle, the formation of the component is completed. Sometimes, particularly in the larger machines, the first few spindles are devoted to blanking and piercing operations. A particularly interesting machine is devoted to the production of snap fasteners. Sliding fingers under cam influence pass the piece, first the blank

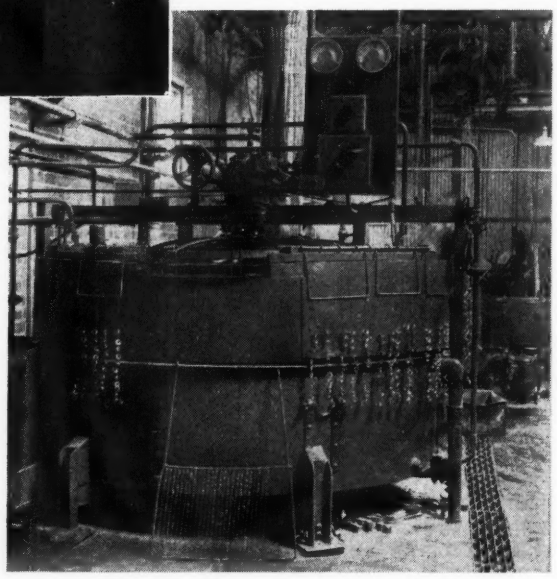
and subsequently the piece in the various stages of shaping, from one spindle to another.

A part of the works with which we are not really concerned in this article is devoted to the production of radio equipment, but some of the machines in question are admirably suited to the production of small parts of the radio section. For instance, resilient valve pins are produced from strip on a pillar press at the rate of 160 per minute. The pin is actually carried in the strip through ten operations, including the final bulging of the article.

In the large machine room good examples of both group and individual driving may be seen, the policy of the company being to use both methods according to definite ideas derived from experience in this special class of work. Individual driving is adopted for all machines with power requirements above, say, 2 or 3 HP, and, largely because of the comparatively low speeds required at the machines, V-belt transmission is strongly favoured. It is easier to obtain the necessarily large speed reductions in this way, even though comparatively low-speed motors are employed; for one thing it is possible to use a much smaller motor pulley with V-belt than with ordinary flat belt.

An ideal drive on one of the larger presses is a ten-to-one speed ratio from a 5-HP motor running at 600 RPM; V-belt is the only power transmission medium. In some cases, however, a geared motor is used. Many of the machines, on the other hand, have much lower power requirements and do not lend themselves readily to individual driving. For instance, a machine which produces eyelets for shoes in one stamping operation, embracing both blanking and forming, requires only ½ HP, and in such a case it would be both difficult and expensive to bracket a driving unit to the machine to get the necessary speed reduction. Thus there is a considerable amount of group driving, an outstanding example being about forty machines all belt driven from overhead shafting served by a 40-HP motor.





Tempering carbon-steel parts in a 45-kVA forced-air circulation furnace, and (right) a large continuous-operation chromium-plating equipment

Special Forming Machine

There are few divergencies in principle from the multiple-spindle type of machine, but a notable example is a special forming machine which, producing from metal strip, operates on the same continuous-production principles as the wire forming machine. The strip is fed horizontally to and through the machine, first through straightening rollers and then on to shaping mandrels. In this way various articles can be completely manufactured from the strip in one piece.

An excellent example of such production is the miniature lampholder. Individual driving from a 2-HP incorporated motor through gears and clutch transmission giving a speed ratio of 10 to 1 is an essential feature of this machine, and the one motor serves for all operations. Different speeds to suit the production of various products are obtained on the change-gear principle. We saw other individually-driven continuous forming machines making the socket springs for snap fasteners—working on wire in these cases, of course.

A surprising thing about the installation is the great amount of machine assembly which is effected, such operations including rolling over the edges of brass circular blanks on to the flanges of snap fasteners, placing the springs on the pins of turn-buttons and rolling over the edges of the spring-container bases of "Durable Dot" fasteners. The drives for the assembly machines are mostly individual, the motors ranging in size up to 5 HP.

The Tool Room

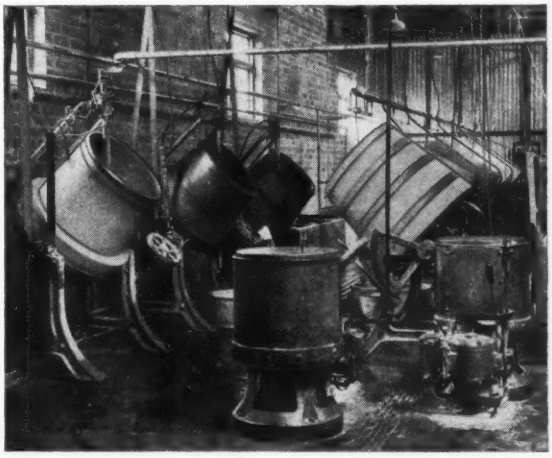
The company adheres strongly to the principle of the manufacturer making his own tools, on the score of closer control in the interests of precision accuracy, and to this end there is a fine tool room in which we again detected the results of that governing policy leading to a mixture of group and individual drives for the more standard types of precision drillers, millers, lathes, etc. But some of the more special equipments with incorporated motors are essentially individually driven; there is, for instance, a universal milling machine self-contained with two motors and push-button control. A 1-HP motor serves the milling head, while both longitudinal and cross movements are provided by a ½-HP motor.

A novel machine in the tool room which should be of particular interest as a time saver to many electrical manufacturers is one by which numerous and intricate filing and sawing operations can be carried out from a central hole in sheet-metal placed in the horizontal plane on a central table. The reciprocating motion for the file and the continuous motion for the band saw are both effected by the same motor, *via* suitable gears, but the "surprise item" is the provision for assembling the endless saw ready for work.

This difficulty is overcome by means of a tiny resistance welder bracketed to the machine uprights, so that the two ends of a length of saw can be joined after threading the saw through the central hole of the working piece. The joining operation is really brazing. Between the clamp jaw electrodes of the welder the two saw ends are first annealed by making circuit when the ends are in loose lapping contact. Bevelling the ends by filing then precedes the brazing operation when the welder secondary circuit is again "made" with the saw ends in bevel contact, the bevel faces being first treated with flux and the brazing medium. Pressure on the joint by a little vertical clamp

and a slight drawing of the hot joint between the electrode clamps complete the operation and the endless saw is then ready for its task.

Electrically the most important part of the zipp fastener section of the works is the blanking shop where the zipp elements are produced from brass strip on the continuous feeding principle by presses which effect both blanking and shaping of the work to complete the production of each element in one machine operation. Except for the much finer work these machines are very similar to many of those engaged in producing parts for the other type of fasteners, and because of the small power requirements group driving is employed exclusively.



Barrel plating is particularly suitable for small parts. A line of plating barrels is seen in the rear, with electrically-heated centrifugal driers in the foreground

Groups of ten of these machines of various sizes, according to the sizes of elements produced, are line-shaft-driven from a 15-HP motor with V-belt transmission on to a flat-face pulley on the line shaft, affording a six-to-one speed reduction from motor to line shaft. Transmission at the line pulley is quite satisfactory, and the arrangement is economical in that the greater expense of a grooved line is avoided, while the advantage of the higher speed-reduction ratio is retained.

In a room above, special machines with fractional-HP and V-belt drives hopper feed the elements to stringing machines in which the elements are squeezed up on the tapes at a very high rate. Default in the feeding arrangements is guarded against electrically. Contact is made continuously with the stream of tape-assembled elements as they pass through the machine to complete a no-volt coil circuit on the motor starter. Should an element be missed the contact would become broken and the consequent break in the no-volt coil circuit would shut the motor down. Assembly of the element stringers with the central drawing unit or slider is a hand operation, and finally each completed fastener is passed through a tiny electrically-driven set of rollers to correct the thickness of the tape-assembled elements to a very fine degree of accuracy.

Heat Treatment and Plating

Hardening and tempering of carbon-steel parts of fasteners are essential, the former process being effected in a gas furnace and the latter process in a Leeds and Northrup vertical furnace with forced-air circulation. The fan beneath the basket (work container) is reversed automatically every few seconds, the cycle being governed by time-and-mercury-switch control of the fan motor. The normal furnace charge is about 1½ cwt., the operating temperature is anything up to 500° C., and the electrical loading is 45 kW.

Perhaps the most interesting section of the works, electrically, is the plating department, including the degreasing vats, in which all the parts from the machine rooms are first treated, and the polishing barrels, which deal with the components both before and after plating. Inclined at about 45 deg. the barrels are revolved, the components inside being thus polished by the consequent tumbling operation in sawdust. About a dozen of the barrels are group driven by a 15-HP motor.

Most of the plating—black and white nickel, silver, cadmium, tinning, etc.—is done on the revolving-barrel principle, too, this method being particularly suitable for such small parts. In most cases there is an inner container which revolves with the wooden outer barrel. The anode is located in the annular space between the container and the barrel and the cathode is at the bottom of the container. On an average about 40 lb. of parts (say 25,000 pieces) are treated in each plating barrel at a time, and the operation takes about 1½ hours. Each barrel is individually driven.

Chromium plating is carried out in a large continuous-operation equipment with a stationary vat and rotary cathode section. The anodes are located round the inside of the circular vat. The parts to be treated are threaded on wires on frames which are hung from the rotating member which is controlled to rotate once in just the time required to finish the plating operation. The rotating member is driven by a small motor mounted above the tank, *via* variable-speed cone gears by which the time per revolution can be adjusted from three to seventeen minutes. A motor-fan in the roof draws the heavier-than-air vapour from the vat through trunking to a suitable receptacle outside the building.

Plating Generators

Serving the barrels there is a three-unit 1,000-A, 12-V motor-generator from which distribution to the equipments is *via* overhead copper-rod busbars, while the chromium-plating vat is supplied from a similar 1,500-A, 7-V motor-generator set *via* copper-tube busbars. The plating equipment comprises a complete Canning installation.

After plating, components are dried in electrically-heated centrifugal machines. A heating chamber on the outer tank of each machine contains six 250-W elements, and, by the fan-shaped basket carrier inside the body, air is drawn over the elements and into the basket while this is revolving. A 1-HP vertical motor has a short V-belt drive to the basket spindle under the machine, and this is arranged to give a small speed reduction, from 1,450 to 1,000 RPM.

All the motors in the works are squirrel-cage machines, of either Brook or Higgs manufacture. The smaller motors are started direct-on-line *via* push-button contactors, while motors of 5-HP and above are provided with star-delta starters.

The electricity supply is taken from the system of the Derbyshire and Nottinghamshire Electric Power Co. at 11,000 V, and is transformed at the consumer's substation to 440 V. Simple distribution to the various departments is effected by Simplex ironclad industrial switch-fuses. The works power factor was recently improved from 0.6 to 0.95 by the installation of two B.I. condensers, one of 85 kVA at the distribution centre of the works in question, and one at the works of an associated company a short distance away the power for which is supplied from the same centre.

We are indebted to the Carr Fastener Co., Ltd., for permission to view the works and to take the photographs, and to Mr. E. Clark, the managing director, and Mr. J. Lawrie, works manager, for their help in collecting and compiling the above information.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

New Year's Honours.—As was anticipated, the New Year's Honours List, published on Wednesday last week, is a lengthy one, and a number of men well known in the electrical and allied industries are included. Knighthoods have been conferred on Mr. Peter Bennett, O.B.E., J.P., chairman of Joseph Lucas, Ltd., past president of the F.B.I. and lately Director General of Tanks and Transport in the Ministry of Supply; Professor J. S. E. Townsend, F.R.S., Wykeham Professor of Physics in the University of Oxford; Mr. A. T. Grant, J.P., managing director of Thomas Firth & John Brown, Ltd.; and Col. A. H. L. Mount, Chief Inspecting Officer of Railways, Ministry of Transport.

Under the Royal Navy awards, Mr. J. S. Pringle, O.B.E., A.C.G.I., M.I.E.E., Director, Electrical Engineering Dept., Admiralty, receives the C.B. (Civil Division).

The Army list includes Major-General A. C. Fuller, O.B.E., A.M.I.E.E., late Royal Corps of Signals, who is awarded the C.B.E. (Military Division).

Dr. E. V. Appleton

Mr. R. A. Watson-Watt

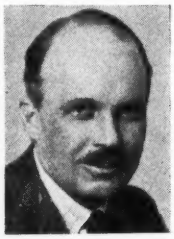
In the list of Civil awards, Mr. E. V. Appleton, D.Sc., LL.D., F.R.S., Secretary to the Committee of the Privy Council for Scientific and Industrial Research, is awarded the K.C.B., and Mr. R. A. Watson-Watt, Scientific Advisor on Telecommunications, Ministry of Aircraft Production, becomes a C.B. Sir Thomas R. Gardiner, K.C.B., K.B.E., Director General of the Post Office, lately joint secretary, Ministry of Home Security, receives the G.B.E., and the Dowager Marchioness of Reading, past-president of the E.A.W. and chairman of the Women's Voluntary Services for Civil Defence, becomes a D.B.E. The C.B.E. is awarded to Mr. G. E. Bailey, M.I.Mech.E., managing director of the Metropolitan-Vickers Electrical Co., Ltd., Mr. R. T. G. French, O.B.E., secretary of the Electricity Commission, and Mr. S. E. Garcke, M.I. Mech.E., vice-chairman of Tilling & British Automobile Traction Co., Ltd., and a member of the Transport Advisory Council.

The O.B.E. has been awarded to Mr. A. L. Barclay, telephone manager, Liverpool G.P.O., and Mr. H. R. Harbottle, assistant staff engineer, Engineer-in-Chief's office, G.P.O., while Mr. A. G. Cook, area engineer, Telephone Manager's office, G.P.O., Mr. W. A. Harriman, M.I.Mech.E., director and general works manager, A. Reyrolle & Co., Ltd., and Mr. J. Aspinall, works director, Hick, Hargreaves & Co., Ltd., receive the M.B.E.

In the Diplomatic List, Mr. J. Webb, M.C., Inspector-General of Telegraphs and Telephones, Egyptian Government, is awarded the C.B.E. (Civil Division).

Among the names which appear in the India Office List is that of Dr. S. S. Bhatnagar, O.B.E., Director of Industrial Development, Advisory Committee, Department of Scientific and Industrial Research, who is knighted. Mr. D. J. Blomfield, chief engineer, Communications and Works Department (Communications and Buildings Branch), Bengal; Mr. L. Fielden, lately Controller of Broadcasting, Government of India; Mr. A. S. Trollip, general manager

Mr. J. S. Pringle



Professor W. L. Bragg

of the Bombay Electric Supply & Tramways Co., Ltd., and Mr. F. A. Farquharson, chief engineer and secretary, P.W.D., Punjab Irrigation Branch, who are awarded the C.I.E. Mr. W. A. C. Bromham, secretary and chief engineer, Bombay Telephone Co., Ltd., and Mr. S. W. Redclift, electrical adviser and chief electrical inspector, Bengal, receive the O.B.E.

In the Dominions Services List the C.M.G. is awarded to Mr. A. M. Wiseman, M.C., H.M. Senior Trade Commissioner in Canada, and the K.B.E. is conferred on Mr. H. W. Clapp, M.I.E.E., for public services in Australia. Mr. C. B. Davies, M.Inst.E.Aust., a prominent consulting engineer in Tasmania, becomes a C.B.E., and the M.B.E. is awarded to Mr. G. J. Braithwaite, superintending engineer in Tasmania, Postmaster-General's Department, Australia.

The Burma Office List includes Mr. S. E. Walker, divisional engineer, Wireless, Posts and Telegraphs, Burma, who is awarded the O.B.E. (Civil Division).

Mr. R. T. G. French

Mr. Peter F. Bennett

Lieutenant (temporary Major) Reginald S. Williams-Thomas, Royal Artillery, who has been awarded the Distinguished Service Order for gallantry in France and Flanders, is a director of S. and W. (Lighting), Ltd., Dudley Port.

The West Midlands Joint Electricity Authority has appointed **Mr. E. C. Scott,** of the Croydon Corporation Electricity Department, as mechanical maintenance engineer at the Ironbridge power station.

Mr. J. Hunt, materials controller with the London Aluminium Co., Ltd., was married on December 21st to Miss Edith E. Law, cashier at the central offices of the Shropshire, Worcestershire and Staffordshire Electric Power Co., Mucklow Hill, Halesowen. Mr. Hunt was presented with a cheque by the London Aluminium Co., Ltd., and Miss Law received an electric standard lamp from the staff of the S.W.S. Co.

Mr. G. E. Windeler, M.I.Mech.E., M.I. Mar.E., is to continue in office as president of the Diesel Engine Users' Association for 1941, and the Committee has been re-elected. Mr. J. S. Tritton has agreed to act temporarily as hon. secretary of the Association in place of Mr. H. V. Stead, who has taken up a commission in the R.A.F.V.R.

Mr. A. L. Thwaites, who is now serving in the Royal Air Force, and who in peacetime is a partner in the firm of Middleton & Thwaites, electrical engineers, Lancaster, has been married to Miss Esther Marion Withers.

Mr. F. H. Skelsey, of Wansbrough & Skelsey, Birmingham, informs us that he is shortly relinquishing the appointment he has held for many years as Midland engineer and representative of the Igranic Electric Co., Ltd. Mr. Skelsey became associated with the company's predecessors, the Adams Manufacturing Co., Ltd., in 1910, and continued with the Igranic Co. when it took over the Adams company.

Mr. G. E. Bailey

At a Christmas dinner in the M.E.M. Canteen, **Mr. A. Wynn,** joint managing director of the Midland Electric Manufacturing Co., Ltd., Birmingham, presented gold watches to fifteen employees who during 1940 completed their tenth year of continuous service with the company. This brings the total membership of the M.E.M. "Gold Watch Brigade" to 224. Five illuminated addresses were also presented to employees who had each completed 21 years' continuous service. At the same time the "W. L. Barber Prizes" were handed to a number of students who had made good progress in studies at the Technical & Commercial Colleges during the past session.

Mr. E. Brindley, manager for the past 25 years of the electrical contracting department of Alexander Hawkins & Sons, Southwark, has recently completed fifty years' service with the company, and has been presented with an electric clock and a cheque to mark the occasion. He has also been appointed a director of the company. Among the work carried out by Mr. Brindley was the electrical installation in the new wing of the London County Hall.

Mr. W. G. Smith has just retired from the position of chief mechanical engineer to the Manchester Ship Canal Co. after forty-five years' service with the company. He is a member of the Institution of Mechanical Engineers and an associate member of the I.E.E.

Col. J. Tennant, works manager of the B.I. Cables, Ltd., Prescot, is retiring but will be retained as consultant on plant matters to the company and its subsidiaries. He is succeeded by **Mr. D. W. Aldridge,** assistant works manager.

Mr. M. J. H. Bruce of the London Passenger Transport Board, who was recently "lent" to the War Office to become mechanical engineering adviser to the Quartermaster-

General, has been appointed Director of Ordnance Services (Engineering) with the rank of major-general.

Mr. J. A. W. Gregory, telephone manager for the Gloucester area, is shortly to retire. Mr. Gregory, who is sixty years of age, joined the National Telephone Co. in 1896. He has been at Gloucester for six years.

Mr. H. R. Mawbey, shift charge engineer at the Mersey Works of the Thames Board Mills, has been appointed power engineer at the company's main works at Purfleet, Essex. Mr. Mawbey was formerly with the North-Eastern Electric Supply Co. and the British Thomson-Houston Co., Ltd.

Mr. G. H. Squire has been appointed joint manager of the Southampton branch of W. T. Henley's Telegraph Works Co., Ltd., in order to assist **Mr. C. W. Pennett** in the present difficult times. Mr. Squire, who has been with the company for twenty-five years, is well known in the area as the company's engineering representative for Southern England.

Mr. Andrew Bailes, Yorkshire sales engineer, to Belling & Co., Ltd., celebrated his silver wedding on Boxing Day.

In reporting the death of **Mr. W. Innes** in our last issue we described him as managing director of the Westminster Engineering Co., Ltd. Actually he was joint managing director with **Mr. W. Meacher** who has now become sole managing director.

Obituary

Mr. W. Cruickshank.—We regret to learn of the death of Mr. William Cruickshank, M.I.E.E., which has occurred at 4, Kelvin Drive, Glasgow. Mr. Cruickshank retired from the position of assistant staff engineer in the research section of the Post Office at Dollis Hill in 1931. Born in 1871, he studied technical subjects at Gordon's College, Aberdeen, and won the City and Guilds of London Institute silver medal in honours telephony. He joined the Engineering Department of the G.P.O. in 1901 and was transferred to the Engineer-in-Chief's office in 1905, where he was engaged in research work on loading coils. He then became a member of the teaching staff of the Northampton Institute, London, lecturing on telephony and telegraphy for fourteen years. During the last war he assisted Col. (now Sir Thomas) Purves in the design of new signal apparatus, and after the armistice went to Cologne. Mr. Cruickshank was responsible for the installation of the electrical communications section at the Faraday Exhibition.

The late Mr. W. Cruickshank

Mr. William Tannahill Calderwood, formerly constructional engineer in the Glasgow Corporation Electricity Department and one-time assistant to Lord Kelvin at Glasgow University, has died at his home in Cathcart, Glasgow. Mr. Calderwood, who was eighty years of age and retired twelve years ago, supervised the erection of the Corporation's Dalmarnock power station.

Alderman J. H. Kearns, of Salford, died suddenly on December 23rd, and the funeral took place at the Manchester Crematorium on December 28th. Alderman Kearns had, since the year 1932, held the position of secretary to the Trade Union side of the Electricity Whitley Council for the North-Western Area. The funeral was attended by Alderman W. Walker and Mr. A. H. Banks, representing the employers' side, and also by Mr. F. Foulkes (chairman) and Messrs. L. Banks, Eccles, Hall, Tudor and Watson, representing the trade union side.

We regret to learn that **Pilot Officer L. G. Burton,** Eastern Counties representative of the Midland Electric Manufacturing Co., Ltd., has been killed on active service. Mr. Burton had been with the company for a number of years. After serving in the Sales Department at the head office, he took charge of the Eastern Counties Area early in 1938. He was a member of the R.A.F. Volunteer Reserve and was called up for service at the outbreak of war.

Major C. E. F. Parker.—The death recently occurred at Gosport of Major Charles E. F. Parker, R.E. (Ret.), a member of the staff of the Portsmouth Corporation Electricity Department. He was mains engineer with the Gosport & Alverstoke Electric Light Co. until that concern was taken over by the Corporation. For some time he was honorary radiographer at the Gosport War Memorial Hospital.

Mr. J. Fenton, who served with Gent, Hurley & Orringe, electrical engineers and contractors, at Leicester, for forty-three years, died recently at the age of sixty-two.

Mr. T. M. Tamblyn-Watts, whose death is reported at the age of sixty-eight, was a member of the staff of the Southend Electricity Department until his retirement in 1937. He was an associate member of the I.E.E. and had written a number of books on electrical subjects.

Mr. G. F. Baird, of G. Fearn Baird & Co., electrical contractors, Glasgow, died recently at his home at Springboig.

Will.—Mr. P. J. Sims, formerly manager in Scotland of the General Electric Co., Ltd., who resided in Glasgow, has left estate of £21,719. He bequeathed £500 to the Electrical Industries Benevolent Association.

Electrical News from Australia

By an Australian Correspondent

THE Royal Commission on the proposed South-West national power scheme presented its report in the Western Australian Legislative Assembly recently, and stated: "We are of the opinion that the population of the South-West portion of this State will have to be augmented considerably before we can recommend the Government to undertake the financial obligations necessary to inaugurate a national power scheme." In September, 1938, a proposal to establish a national power scheme at Collie was referred to the Electricity Advisory Committee, and in November of that year the committee was granted the powers of a Royal Commission to examine and report on the matter. Members of the Commission, who acted in an honorary capacity, were Mr. F. E. Shaw (mechanical engineer of the Public Works Department), chairman; the general manager of the Government Tramways & Electricity Supply (Mr. W. H. Taylor); and the manager of the City of Perth Electricity & Gas Department (Mr. F. C. Edmondson). "The area covered by the recommendation," stated the report, "is of 4,500 square miles, with a total population of 50,000, some 16,000 being in 22 town-sites. Average distance between towns is 16 miles, and density of population only 11 per square mile. Anticipated electrical demand would not exceed 1,800,000 units in the first year, cost of generating which would be 2d. per unit, with a distribution cost of 7d. a unit. Capital expenditure required would be £776,000."

The Western Australian Minister for Railways recently announced in the Legislative Assembly that the date of expiry of the agreement made on January 28th, 1916, between the Government, the Commissioner of Railways, and the Fremantle Municipal Tramways and Electric Lighting Board (relating to the supply of electricity) was April 26th, 1942, with the option of renewal for another twenty-five years, an option which had now been exercised.

An electric dual-power motor car, designed to run on its own generated power, was inspected recently at the Linden Park (South Australia) works of the J. B. Inventions Syndicate. This car was successfully started on the power if its auxiliary engine alone, and a maximum speed of 30 to 40 miles per hour on electricity, and 50 to 60 MPH on dual power was attained.

In his annual report the West Australian State Mining Engineer (Mr. R. C. Wilson) states that a steady increase in electrical equipment is taking place throughout the goldfields in Western Australia. In following the general present trend to discard steam haulage in favour of electricity, two new electric winders have been installed by the North Kalgurli (1912), Ltd. Lake View & Star are making preparations for an extension of their power house, and the Western Mining Corporation has extended its power houses at Norseman, Kalgoorlie and Cox's Find. The new turbo-generator installed by the Kalgoorlie Electric Power & Lighting Corporation has proved satisfactory, and the company's faith in the future of the goldfields has been shown by orders for the extension of the boiler plant.

The operations of the Government Electricity Supply formed a portion of the recent annual report of the Western Australian Commissioner for Railways (Mr. J. A. Ellis). Mr. Ellis stated that the surplus for the year was £38,082, compared with £24,096 in 1938-39. Earnings increased by £9,824, while working expenses decreased by £12,085. The percentage of working expenses to earnings was 70.98, with net revenue showing a return of 6.47 per cent. on the capital. The benefit of the modern "B" station was apparent in the substantial reduction in the fuel bill, for, notwithstanding increased output and an increase in the cost of coal, that item showed a decrease of over £27,000.

Particulars recorded clearly indicated the efficiency of the new "B" station working at high steam pressure against the old "A" station with low steam pressure and temperature. Although output increased by over 4½ million kWh coal consumed was 27,181 tons less than for the previous year. The "A" station had not at any time exceeded 13 per cent. thermal efficiency, whereas the "B" station over the past year recorded 24.5 per cent., and for a month reached 27.6 per cent. Extensions, to cope with the increased demand for electricity, were to be undertaken, including the duplication of the transmission line to Bassendean for the new steel furnace of Hadfields, Ltd., but the lack of copper had so far retarded these.

WAR DAMAGE TO MAINS

Overcoming Results of Bombing

By W. E. Bradshaw, A.M.I.E.E.

BEFORE the war much brainwork was expended in attempts to anticipate what would be required in the way of cable maintenance if and when air raids began. Many kinds of joints were devised to enable important cables to be quickly jointed without heat, sweating, or wiping, but I have not yet had to use those we purchased.

In my district some of the heaviest attacks have been made and cables of all varieties, from 11-kV feeders to 200/400-V distributors, have been put to severe tests. How they have stood up to it is astounding. Cable manufacturers would have resented a clause in pre-war specifications making it a condition of acceptance that the cables should be capable of stretching one foot in sixty without damage to dielectric or lead sheathing. It has, however, been abundantly proved in the last few months that British cables would have had no difficulty in complying with such a condition. Even cables for pressures up to 33 kV have proved their British tenacity in this way.

At the moment an 11-kV three-core cable in this district is carrying load, although it has disappeared due to the collapse of the crater edge and is many feet below its correct level. One of our 0.2-sq. in. high-voltage cables has been found lying on the surface of a carriageway, whereas it was originally drawn into a cast-iron pipe two feet under the footpath; yet it continued to supply a whole district until we could cut out the somewhat embarrassing slack and replace the rest in its original position, where it is still in use.

The author, who operates in a heavily bombed area, shows how much cables and associated gear will withstand and gives advice on the repair of damage

On the other hand, cables up to 0.3-in. in cross section have been completely severed. The sleeves of wiped joints have been pulled apart in the centre, together with the cores, and the only indication as to where one end has gone is frequently a solitary strand of binding wire disappearing up the pipe, this wire being originally part of the "married" joint of one of the cores. In one case a network box on the low-voltage distributors was missing after an air attack. It was found in a basement with the cables still attached. We put it back in approximately its original position, propped up on wooden stakes, and it proceeded to function as usual. Unfortunately some curious member of the public afterwards removed the lid when no one was looking and left "live" conductors exposed. We have now had to chain and padlock the lid to the box.

Negotiating Craters

Mr. M. Cline states in his article in the ELECTRICAL REVIEW of November 15th that the bomb performs part of the excavating work and that one simply excavates a little farther to find the good ends, laying in a new piece and joining up again. My experience is that such excavations are too wide and too deep to serve any practical purpose. Our prize crater was 60 ft. wide by 35 ft. deep. We dare not relay cables across this gap, even though it is now filled up, because subsidence must occur continuously for a long time. We now know that cables will stretch a long way, but we hesitate to try their tempers unnecessarily. We have also been recommended to lay temporary cables round a crater. We have succeeded in doing this once only; in every other case it has been too precarious a job for ourselves and for the cables to attempt. Perhaps it is because we have been honoured with rather larger bombs than in some places. At any rate, as it had been emphasised so often that bridging the gap was the correct thing to do, we called in an unbiased opinion to tell us how to do it. These extra brains could find no solution, except to hurry up the R.E.'s, get the overhanging buildings removed and the crater filled up.

In another case, a network box in a manhole from which four cables radiated, north, south, east and west, was situated at the corner of a street junction. The spot which the box originally occupied became a vacant space, the bottom being 10 to 15 ft. deep. The corner buildings collapsed and box and cables were blown to pieces. Even supposing we had found a way of suspending box and cables in mid-air, they would have prevented the repair of lower-lying sewers and gas and water mains.

Nevertheless, in spite of our lack of success in bridging gaps, very little inconvenience has been caused to our consumers by the "blitz." We treasure several letters, written without prompting, by consumers, who have hastened to express their appreciation of the quick restoration of the supply of electricity. The public is usually quicker to make *adverse* criticisms, but in this matter we have had none whatever.

The secret of this avoidance of temporary joints and "bridge-overs" has been in the planning of the system long before war began. The germ of the matter has been to ensure that every high- or low-voltage main has at least two sources of supply. Our treatment of practically every crater has been the same. All the mains have been cut and pot-ended as near the edge as possible and made alive from different directions up to the crater. As soon as a solid foundation has been provided by filling the crater, partly or wholly, permanent reinstatement has been carried out.

Cables in pipes or ducts generally pull apart at the nearest joints. Sometimes damaged joints have been found a very considerable distance from the crater. In some cases the cables have been pulled out of the sweated fittings under the compound in network boxes. In others the fittings have been pulled over bodily and have made contact with the walls of the box. It has usually been found advisable to replace high-voltage cables between joints, as the joint is undoubtedly the weakest part. This means anything from 50 to 100 yd. of cable in each case. We did at first try to economise, but in one case a 2,000-V main broke down twice after we had, as we fondly imagined, finished with the job.

When letting in lengths of three-core 11-kV cable, there were some misgivings lest a change-over of the colours when jointing should make it difficult to phase out at the switchboard ends of the feeders. There need have been no such anxiety. In every case the colours of the cores have phased out correctly. This subject was discussed in an article by the present writer on "Lay in Cables," which appeared in the ELECTRICAL REVIEW of August 31st, 1934. The facts briefly are these. Assuming that cable from the same manufacturers is used to replace the damaged length and assuming also the length of cable drawn in is the same as that drawn out, there need be no fear about being able to keep the colours the same. It is a matter of lay of the cores. It does not matter whether the rotation of colours looking at the end of the new cable is the same as before, *i.e.*, red—yellow—blue or red—blue—yellow.

Importance of Joint Records

It was mentioned in the earlier article that, when making a joint, the colours joined together should in every case be carefully recorded. It is assumed that no one tries to get colour to colour in large cables. These records of joints have now proved their worth. For instance, in one case we have to cut out two intermediate joints. In other words, we replaced three lengths by one length. By carefully tracing the colours through each joint, we knew what the new joints must do. By slight movement of the cores, the colours we wanted were jointed together and the phasing remained as before. To avoid mistakes, however, the following must be remembered. The new cable must be of the same length and must have the same "lay" as the cable replaced. It is necessary to know which colours must be connected together and to see that this is done. This all sounds rather complicated, but actually it is quite simple and need cause no anxiety.

To lay a greater length than the damaged portion is not so easy. In such cases the jointing will be simplified if the engineer makes sure that the *rotation* of colours in the new cable is the same as in the old. If this is not done, it may be necessary to cross over two cores in a joint, which in my opinion should never be done, or change over the tails at the switchboard, which in some cases is very awkward. Cable made by the same firm is mentioned, because "lay" is not standardised, and different manufacturers may not adopt the same policy.

LOOM MOTOR PROTECTION

Precautions that Should be Taken to Avoid Breakdown

By A. Brady

In this article the author details the various faults that should be guarded against and also the ways in which they can be overcome

INDIVIDUALLY driven damask weaving three-phase AC motors of ¾ HP and upwards have scope for improvement in their protection against running on two phases and upon those occasions when "jamming" may occur in the loom while the starting handle is in the on position.

The ordinary push-button-solenoid clapper contactor switch with temperature overload trips does not altogether solve the problem on account of the frequency of starts and stops, which play havoc with the contacts. The coupling up of a simple three-phase ironclad on-and-off switch to the loom handle (fig. 1) is preferable since it calls for less maintenance due to burned-up contacts. The contacts on these switches stand up to the make-and-break remarkably well. Also, the design of the contacts tends to reduce the effect of destructive arcing since they slide off to a very narrow point at the instant of breaking, thus narrowing the limit of the arc considerably. They fail completely as a protective device, however.

The load variation of a damask weaving loom is very marked, usually something between the values in figs. 2 (a) and 2 (b). The load will follow the pattern being woven and certain light and heavy periods occur as shown. Obviously, protection solely by fuse of a motor working under such conditions is totally inadequate if only for the fact that the fuse must be heavy enough to withstand the starting currents of short jerks when occasion demands, and light enough to blow when the motor passes abnormal currents, such as when working on two phases.

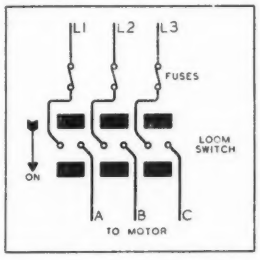


Fig. 1.—Usual arrangement of three-phase loom switch

Fig. 2 shows the motor taking a mean light load of 5.5 A per phase and a starting current of 15 A. A No. 30 gauge copper wire will melt at around that figure and it will not take more than a few jerks on the starting handle to blow the fuse. This No. 30 wire exceeds full-load carrying capacity by 300 per cent., whereas it is common practice to allow only 200 per cent.

If this motor carried a steady load a No. 32 gauge wire would be sufficient, with a margin to spare. In practice, however, it will soon be found that none of these wire sizes will do, and that even a No. 29 gauge will blow with dismaying frequency if the loom jams too often. If the fuse is heavy enough on the occasions when the loom jams, the motor will pass an excessive current while it sits and hums until someone knocks off the switch, or until, if the loom is fitted with one in working order, the automatic knock-off motion comes into action.

By the insertion of a No. 29 gauge wire a compromise is reached between a few unnecessary stops caused by blown fuses and the risk of passing 15 A, under faulty conditions, through a motor winding that is normally designed to carry a little over 33 per cent. of this value as a maximum.

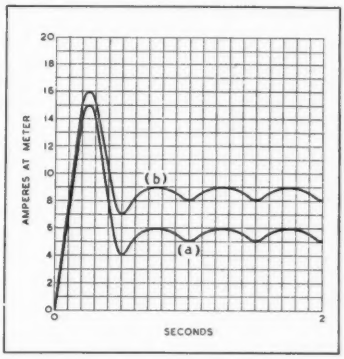


Fig. 2.—Load variation of a damask weaving loom on (a) light and (b) heavy load

Another less frequent fault which has dangerous possibilities is due to a careless weaver leaving the starting handle on when the power is shut off for the lunch interval or stopping period at the end of the day. If the automatic knock-off device fails to function (and this happens quite often), when the current is switched on again the motor will sit and hum, and if the fuses do not blow a burned-out winding is possible as the motor hum is difficult to hear in the prevailing din in a weaving shed.

A very difficult (and unfortunately not rare) fault to locate is when the switch starts the motor on three phases, but, owing to one of the contacts becoming less springy or more worn than the other two, allows the defective contact to fall out of connection. This can readily happen if any considerable backlash exists between the starting handle coupling and the switch, the fault occurring when the weaver removes the pressure of his or her hand.

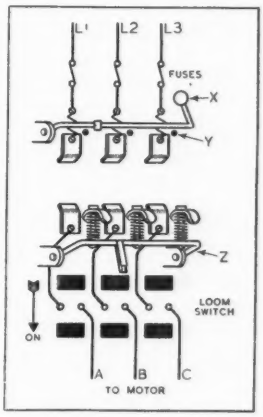


Fig. 4.—Method of protecting a loom motor from damage caused by faulty starter switch, showing (X) stop button on trip bar for emergency use, (Y) overload bimetal temperature trips and (Z) pivoted bridge contactor bar with hand replacement

After the motor has got away on three phases it will run quite well on two phases with an unnoticed increase in hum and slip. Often the contact does not break completely but will intermittently make-and-break due to carbonisation, vibration or other causes. A clean break after the motor has been started on three phases means that the motor currents will be something like those shown in fig. 3. The motor windings will not run long under such conditions without becoming seriously affected by the excessive heat when the loom will run

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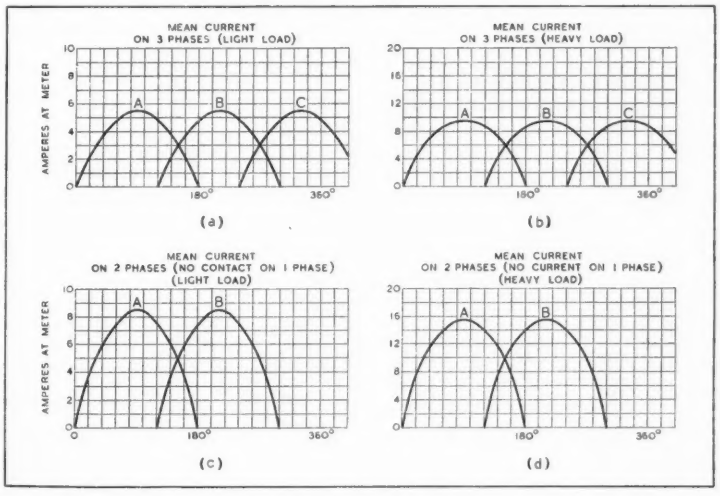


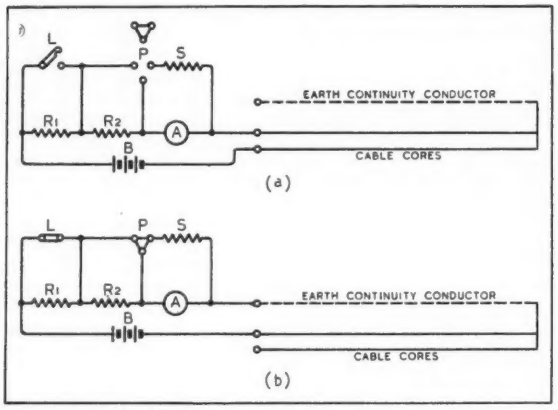
Fig. 3.—What happens when one of the three-phase contacts is faulty

EARTH CONTINUITY RESISTANCE

How a Simple Testing Apparatus can be Adapted for Measuring It

By G. W. Stubbings, B.Sc., A.M.I.E.E.

IT is now a soundly established principle that when an electrical installation includes metal-sheathed cable or apparatus, the safety of the consumer depends upon efficient continuity of the conducting system that connects exposed metal to earth, and upon the provision of efficient means whereby the supply is disconnected when, because of leakage, this conducting system tends to assume a potential different from that of earth. The second of these two essential



A simple modification of an ordinary testing equipment for readily measuring earth continuity resistance

features of an installation is achieved either by low-resistance earthing or by the provision of an earth-leakage trip. The first is obtained by low-resistance bonding of sections of the earth continuity conductor to each other and to exposed metal. The relevant I.E.E. Regulation stipulates that the resistance of the earth continuity conductor, together with the resistance of the earthing lead shall, when measured from the connection with the earth electrode to any other position in the completed installation, not exceed one ohm.

The implications of this stipulation are more far-reaching than appears at first sight. The phrase " any other position in the completed installation " includes the terminations of all branches of the earth continuity conductor, so that a test to verify that the I.E.E. stipulation is satisfied ought to include resistance measurements between the point of junction to the earthing electrode of all such terminations.

The importance of this implication appears when consideration is given to the matter of routine testing, which is called for in the latest (eleventh) edition of the Regulations. The form on which the results of maintenance reports are to be recorded includes an explicit reference to one resistance for the earth continuity path. This seems to lead to two inferences. The first is that the earth continuity conductor has one resistance value only, whereas, as we have pointed out, it has as many values as there are terminal ends. The second inference seems to be that an actual resistance measurement is essential, and that the more usual test to confirm that the resistance of the earth continuity path does not exceed the stipulated maximum is not sufficient. The looseness with which this regulation has been drawn up is regrettable, as a loophole is left for inconclusive inspection. A complete test of all paths in an earth continuity conductor system, while quite feasible on a new installation, is often difficult to make on an installation that has been in use for some time.

Methods of Checking

Earth continuity resistance can be checked in two ways. The first way is actually to measure the resistance, which is done most conveniently by an instrument of the ohmmeter class. Two actual measurements are required as a rule: the first that of the continuity conductor and the leads connecting it to the instrument; the second the resistance of these leads alone. The difference of these two measured values gives the required resistance.

The second method of checking is simpler and can be done with a much cheaper equipment. Current from a battery is passed through an ammeter and the earth continuity conductor, and the ammeter reading is noted. A one-ohm resistance is then placed in the circuit, and the ends of the connecting leads are joined together. If the second reading is less than the first the resistance of the earth continuity conductor is shown to be less than one ohm, and the stipulation is satisfied.

A little practical difficulty arises in the checking of the resistance of long lengths of earth continuity conductor to isolated consuming devices, because inordinately long connecting leads are required in the normal methods of testing. In such circumstances it is quite feasible to use the conductors of the power cables for connecting the continuity conductor to the instrument, and the accompanying diagrams illustrate a simple modification to an ordinary testing equipment whereby such permanent cable conductors can be used without the necessity of calculation. The modified testing equipment includes the

(Concluded on next page)

Loom Motor Protection *(Concluded from preceding page).*

(according to the size of the lea on the shuttle) from four to seven minutes at a time before a stop is made to change a bobbin.

Two methods could be used to protect the motor adequately from the above faults without employing the pushbutton-solenoid-contactor switch, the chief disadvantage of which is the rapid destruction of the contacts under the arduous switching frequency.

The first method is to allow the existing manually operated switch to remain, with the addition of a three-phase contactor switch minus the hold-on magnet coil, and with three adjustable overload temperature coils surrounding bi-metal tripping strips, setting of which would enable the toggled switch bar to be tripped to the off position by the encased bi-metal strips when the temperature rose above a predetermined limit. This would provide the time-lag necessary so as to prevent short intermittent breaks from stopping the loom. The switch would also be provided with on-and-off manually operated buttons to be used in emergency (fig. 4). The temperature tripping coils only consume from 7 to 10 W per switch. A small contactor switch of up to ½-HP capacity of this design has been on the market for some years.

The second tripping arrangement could also be devised to act as a balance between three magnet coils, and adjusted to operate the warp-stop motion on the loom. The warp-stop motion is a sliding notched bar which moves to and fro within a counterpart notched U. Any body interposed, such as the light stee stamping suspended by the warp thread which falls into the notches when a thread breaks, will automatically stop the loom. (See fig. 5.)

Any out-of-balance current between the phases will act on the soft iron and pivoted armature to pull it to either side and insert the light metal strips connected to the armature between the notches of the warp-stop motion. It would not be difficult to fit a small time-lag dashpot so as to reduce the sensitivity of the arrangement which might become annoying if the fault were only an intermittent one.

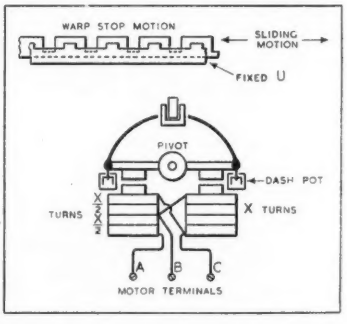


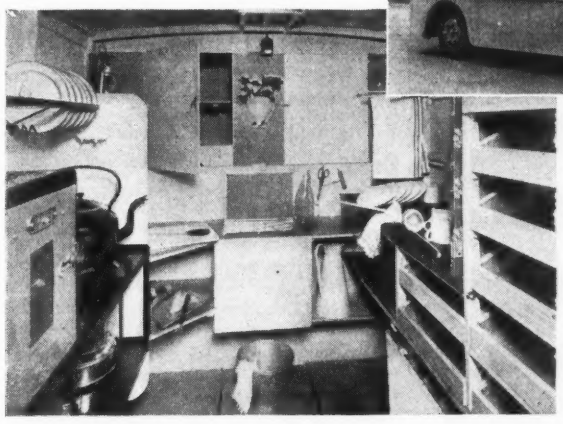
Fig. 5.—An alternative tripping arrangement operating the warp-stop motion on the loom. When U is engaged through slots to the sliding motion, the loom will stop

E.A.W. AND THE WAR

A Re-direction of Activities

WHEN the war started one might have been excused for anticipating a cessation, or at any rate a diminution, of the activities of the Electrical Association for Women. How wrong this idea was can be gathered from the following very brief survey of activities during the past eight months which demonstrates that an association such as this with its energetic and enthusiastic members can play an equally useful part in war conditions as in peacetime, even though its original objects may have been somewhat restricted. This fact is emphasised by the announcement just made that the Association is to hold its annual conference as usual, an official invitation having been received from the Mayor of Southport to meet there on May 8th and 9th. The full programme will be announced later but an official welcome and a civic reception have already been promised.

Among the useful and varied work carried out recently by the Association one of the most outstanding has been in connection with the provision of mobile canteens, primarily for the use of members of the Forces in remote districts but also of great value on occasion for supplying meals, etc., to the homeless in badly bombed districts. Twelve of these canteens are now in service, including one electrically driven unit bought by subscriptions from E.A.W. members. This canteen has recently been doing fine work in the London and Westminster districts and this week the *Pathé Gazette* has been making a film of it. In connection with these canteens a maintenance fund has just been started and this has already received generous support.



The electrically driven canteen provided by subscriptions from E.A.W. members

The popularity of the E.A.W.'s educational film "Miss T" proves that it is fulfilling a definite need. Incidentally the Health and Cleanliness Council has now produced another film "Now and Yesterday," which is actually the next stage in Miss T's career. The "Cheerful Rationing" cards, now in their second series are becoming more and more popular and are now available in paper editions for distribution by electricity undertakings. As most of our readers already know, the director of the Association, Miss Caroline Haslett, has become adviser on women's training to the Ministry of Labour, and she has also been invited to join the 1940 Council, the objects of which are to co-ordinate all branches of reconstruction work for the future in connection with social environment.

All branches, with the exception of a few in particularly vulnerable areas, have carried on their work and found outlets for their energies. The London Branch is among those which is providing equipment for hospitals, socks for men served by the mobile canteens and garments for evacuated and homeless people, while the South London Branch collects books for balloon barrage units. Walsall has "adopted" a destroyer; Glasgow has provided twelve electric blankets to be used for men suffering from exposure after shipwreck; and Edinburgh has covered about 7,000 houses in connection with the salvage scheme, as well as organising a Food Week. In co-operation with the Women's Branch of the British Legion, the St. Austell Branch has opened a canteen and rest room for the Forces at which nothing costs more than 3d. A potato-growing competition was organised by the West Kent Branch.

Earth Continuity Resistance (*Concluded from previous page*).

ammeter A and the usual standard one-ohm resistance R, with its short circuiting link L.

Additional to these are a second one-ohm resistance R_2, a shunt S that reduces the reading of A to exactly one-half, together with a three-pin plug socket P, whereby, using a short-circuit plug, S can be put in circuit, and R_2 short-circuited. With the plug in the socket S, the instrument can be used in the normal way. For testing long runs of earth continuity conductor the instrument is first joined by short leads of negligible resistance to the ends of the pair of cable conductors associated with the earth continuity conductor, which, at the far end is solidly connected to both the cable conductors.

The plug and the link are first both removed as shown (a) in the diagram. Then let the unknown resistance of one of the cable conductors be R. Accordingly, as two ohms of standard resistance is in circuit, the ammeter reading will correspond to $\frac{V}{2\ (1+R)}$ where V is the battery voltage. The connections are then modified as shown (b). One terminal of the instrument is joined by a short lead to the near end of the earth continuity conductor, and the second terminal is joined to one of the cable conductors. The link and the plug of the instrument are both inserted. The resistance in circuit is now X + R, where X is the unknown earth continuity resistance, and as, by reason of shunting, the ammeter range is halved, the reading of the instrument will now correspond to $\frac{V}{2\ (X+R)}$. It thus follows that if the earth continuity resistance does not exceed one ohm, the second ammeter reading will be equal to or greater than the first.

Corrosion of Duralumin

IN a research paper of the National Bureau of Standards (United States), particulars are given of a study made by Mr. H. L. Logan with a view to ascertaining the reliability of basing predictions of the susceptibility of the duralumin-type alloys to inter-crystalline corrosion on electrode-potential measurements. These measurements were made in a potassium chloride solution against a saturated calomel electrode.

A condenser, charged by this galvanic cell, was discharged through a calibrated ballistic galvanometer. A comparison of the measured potentials with the result of corrosion tests on the same specimens showed that materials with electrode potentials more negative than 0.0657 V at 25 deg. C. were in general susceptible to inter-crystalline corrosion, and those with less negative potentials were immune to this type of corrosion.

UNARMOURED CABLES

Is the Provision of Steel Armouring Superfluous?

By R. W. L. Phillips, M.I.E.E.

From his experiences as borough electrical engineer of Bedford Mr. Phillips has come to the conclusion that the present prohibition of steel armouring need not increase the risk of breakdown or reduce the life of cables

IN these days when every pound of steel is required for our war effort and much ingenuity is being displayed in the design of many every-day articles to find a substitute, it is well to consider whether or not the steel armouring of electric power cables, which I understand is now prohibited, can be dispensed with without increasing either the risk of breakdown of the supply or reducing the useful life of the cable.

In the early days of electricity supply, the practice of laying cables direct in the ground without conduits or some similar protection was looked upon by many as being risky, principally because in many soils the lead sheathing would be liable to attack by corrosive salts. This, in fact, did occur until a suitable compound was found for impregnating the protective jute covering. Armouring was added as a *sine qua non*, the idea being that it was a necessary safeguard against mechanical damage. Experience soon showed, however, that it provided little or no safeguard against the blow of a pick or other tool used to break up the roads.

The usual way to protect a cable that is to be laid direct in the ground is to serve the lead sheathing with a layer of jute before laying on the armouring and a further layer of impregnated jute to protect the armouring from the corrosive action of the soil. The first layer acts as a bed for the armouring, thus preventing it damaging the lead, but I think that the success of direct-laid underground cable is due not so much to the armouring as to the double layer of impregnated jute so made necessary. There is no doubt, however, that the actual compound chosen for impregnating the serving is a vital factor in the life of the cable.

Improved Impregnation

In early days the impregnation of the jute was sometimes such that in two or three years the jute completely rotted and the armouring was rusted through. Other cables laid at the same time, when a different compound was used, are in perfect condition to-day after thirty to forty years' service. It is safe to assume that the compounding is now in this respect practically perfect and that cables laid to-day will have so long a life that this factor need not seriously be considered.

The net result of experience is that all that the lead requires for its protection is a double layer of jute serving thoroughly impregnated, both before and during laying on, with a compound, the composition of which is, I believe, a secret of the cable makers. It remains to consider whether the armouring of the cable, as normally provided, is a sufficient mechanical protection to justify its expense and the use of steel so much required for other purposes at the present time. In this connection my experience when holding the position of borough electrical engineer at Bedford may be of service. There some 230 miles of medium-voltage cable, 80 miles of cable up to 3,000 volts and about 45 miles of higher-voltage cable were laid direct in the ground without armouring.

It would appear that in the actual laying of the cable greater care is required, although in normal soft soils very little difficulty was experienced. In stony soils it was deemed advisable to import sufficient soil or sand into the trench to form a bed for the cable, but it was never proved that this was really necessary. Normally, at a depth of anything from 18 in. to 3 ft. the soil was sufficiently soft for the purpose and in only a very few cases was a protective bed provided. I can definitely say that, in practice, once an unarmoured cable is laid, it is, in most situations, no more liable to suffer mechanical damage than an armoured cable.

Avoiding Damage in Handling

In the actual handling and laying of underground cables, practice has established many excellent rules such as avoiding sharp bends, not moving a cable across a trench with a crow bar and taking extra care or allowing increased depth in roadways liable to heavy traffic or excessive vibration. If these rules are not observed an armoured cable is as liable to subsequent breakdown as an unarmoured cable, and this is the lesson of experience.

I understand that in the manufacture of unarmoured cables for direct laying, it is, in some cases, the practice to provide the cable with two layers of impregnated paper directly over the lead as a protection against chemical action, followed by a final covering of two layers of impregnated tape. The paper is no doubt a wise precaution, but it never struck me as being necessary and no difficulty was experienced in this respect in Bedford with only the ordinary double serving of doubly impregnated jute.

From my experiences I am a little doubtful whether tape as a final serving will stand either the dragging along the ground or in the trench so well as rough jute serving unless it be of a heavy woven material. Further it is on the thorough soaking with compound of the jute that the life of the cable depends and tape is less likely to hold so much compound as ordinary loosely spun jute serving. If it could be done without unduly putting up the cost of manufacture, a better method would be to "braid" the final jute covering under a stream of compound when manufacturing the cable.

Incidental Advantages of Unarmoured Cable

On all the cables laid in Bedford, no special hard alloy was employed and, as far as I am aware, the lead sheathing complied with the British Standard Specification for plain lead sheathing and no conditions existed that suggested the necessity for a harder alloy.

There are, too, incidental advantages in the use of an unarmoured cable. It weighs less, which affects both transport and handling; it is easier to joint (this is especially useful when making service connections to low-voltage distributors) and the money saved by dispensing with the armouring can be more usefully employed elsewhere.

In connection with the Bedford undertaking, I carried out an extensive and intensive electrification of a rural area of about 200 square miles. In the majority of the villages it actually cost less to lay unarmoured low-voltage distributors than to provide the same service by means of overhead wires. Not the least of the advantages accruing from this was the securing of the goodwill of the country inhabitants who, at that time, abhorred the prospect of having overhead lines erected in their villages.

At the time these cables were laid the saving effected by dispensing with the steel-tape armouring was approximately as shown below and for those who prefer steel wire armouring the saving would be greater:—Low-voltage, four-core: 0.0225 sq. in. 20 per cent. and 0.2 sq. in. 10 per cent.; low-voltage, three-core: 0.0225 sq. in. 25 per cent. and 0.2 sq. in. 10 per cent.; high-voltage (11kV), steel-wire armoured: 0.01 sq. in. 30 per cent. and 0.1 sq. in. 25 per cent.

Armouring a Waste of Money

Some of the cables in the Bedford area have been in the ground many years and no trouble attributable to the absence of armouring has been experienced. For many years I have been convinced that the armouring of cables is merely a waste of money and would like to assure all concerned that they need not feel any anxiety now that steel is not available for this purpose and can happily spend the money saved on something else.

Although I have retired from the ranks of the supply engineers and have thus relinquished a good deal of practical responsibility for my opinions in matters of this description, it should be mentioned that I started laying underground cables direct in the ground about 1893 and continued to do so in cities and country towns up to 1938. During this time many opportunities arose of observing the conditions of these cables in the ground and the foregoing is the net result of these observations. Personally, I am glad that steel is no longer available for this purpose in so far as actual experience will, I feel sure, soon convince those who now think otherwise that it is superfluous.

NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Underwater Pumps

SUBMERSIBLE electric pumps of a design which originated in Vienna some twelve years ago are now being made by SUMO PUMPS, LTD., in the Lighthouse Works of the parent firm (Chance Bros. & Co., Ltd.) at Smethwick, near Birmingham. These lightweight sets can be lowered without the aid of a winch or block and tackle (the smallest weighs 53 lb.), while foundations or a pumphouse are not necessary.

Both elements are combined in a cylindrical casing and suspended from the lower end of the rising delivery main, which pipe is held by a clamp resting on the lining tube of a bore hole, or on the joists or girders of a deep well. Operation is noiseless and since there is no commutator the motor will not interfere with radio reception. There are no long rods or shafts, or suction pipe. The direct intake is through a strainer between the two machines, the motor being vertically below the radial pump, which is a multi-stage centrifugal type, with stamped bronze impellers and guide vanes, water lubricated plain bearings and a mushroom non-return valve integral with the outlet.

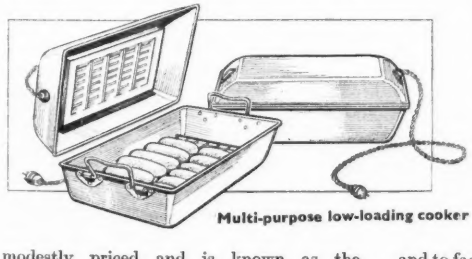
The smaller sizes (1.25 in. outlet) have a common shaft and the larger are solidly coupled to an AC squirrel-cage motor having a non-corrodible rotor immersed in water while a thin alloy cylinder (which is the main feature of the "Sumo" system) protects the stator winding against the ingress of moisture.

Three-phase models are arranged to operate at 400/450 V. The standard single-phase machine is for 230/250 V and of the capacitor type, with one of its windings permanently in series with a condenser of from 15 to 120 μF and the other connected direct to the mains. Hence the starting current will not exceed twice the full load value and in addition the power factor of the machine is improved.

The lead-in cable is sheathed with extra-tough rubber, clipped to the rising main and makes a watertight connection to the motor, which may be controlled by a float switch or on the automatic pressure system, the starters preferably being supplied by the pump makers.

Emergency Cooker

A small multi-purpose cooker that is intended to serve as a standby for use in emergencies is being supplied by L. G. HAWKINS & CO., LTD., 30, Drury Lane, London, W.C.2. The appliance is very modestly priced and is known as the "LGH123 Supreme." It resembles a pair of tin-plate baking pans, 10 in. wide and 12.5 in. long, one inverted over the other. To the upper half is attached a 650-W heating element, as illustrated, with a ventilating aperture at one end. The lower half accommodates a wire grid, 10.25 by 6.5 in. and standing 2.5 in. high, on which 2 lb. of sausages or chops, with sliced vegetables of equivalent weight, can be nicely grilled in 25 minutes. At the same time a pint pot of water can be kept boiling on top, or plates heated.



Multi-purpose low-loading cooker

For baking purposes the whole device may be inverted so that the element is at the bottom (it must accordingly be stood on something that will not burn) in which position a 3½ lb. joint can be roasted in an hour and a half; or, alternatively, small cakes may be baked with the wire grid standing over the element and supporting a shallow tin to act as a heat distributor. The portion containing the heating element is made to stand up vertically for use as a radiator fire, or it can be utilised horizontally for frying, boiling or making toast.

Street Lighting Lantern

A street lantern, specially produced for use under wartime conditions, which complies with the requirements of BS/ARP.37, approved by the British Standards Institution for 10, 15 and 20 ft. mounting heights, is offered by CROMPTON PARKINSON, LTD., Electra House, Victoria Embankment, London, W.C.2.

The illumination provided has a minimum of 0.0002 ft.-candle on road level and a maximum of 0.0004 ft.-candle, in all cases of all mounting heights. Each fitting is stamped with the special B.S.S. seal indicating the wattage of the lamp to be used. In addition to the essential necessity of providing that the bare lamp is invisible from any angle, simplicity of installation is achieved with ease of maintenance. This soundly constructed lantern is fitted with a die-cast tapped ¾-in. conduit, the reflector and body being of 22 gauge sheet metal, finished externally in black enamel, and internally in white, the reflector being battleship grey.

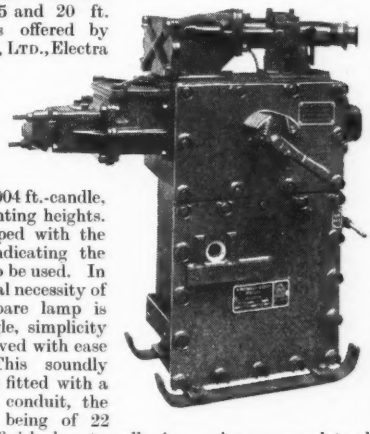
The fixing is arranged in an easy manner, so as to afford accessibility for both cleaning and renewing lamps, meaning easy maintenance, which is furthered by the facility of being able to gain access at both top and bottom of the lantern for lamp renewals. An expense-reducing feature is that the unit is readily fitted to existing lanterns.

Unit-type Flameproof Switchgear

Air-break switchgear of the three-phase flame-proof pattern for up to 660 V is not merely applicable to mining, but is generally suitable wherever there is risk of explosion, such as in chemical factories and the petroleum industry. Type "G.A.4" for up to 100 A of the improved design now being offered by A. REYROLLE & CO., LTD., Hebburn-on-Tyne, is constructed on the unit principle for easy installation and maintenance and to facilitate extensions. Each is normally mounted on separate skids, but stands are obtainable for permanent fixing and several may be bolted together to form movable switchboards.

The welded steel casing is divided into two compartments; the upper one accommodates the isolator and busbars, supported in the middle, each end passing through a flame-proof bushing into a separate air-insulated flame-proof enclosure, which may be either a terminal chamber or an end-cap. When outgoing cable boxes are fitted the isolator has a third position to make it comply with earthing requirements in mines; when outgoing plug-sockets are provided the isolator simply reverses without an earthing position as is commonly done for controlling motors.

Interlocking prevents movement of the isolator without first tripping the circuit-breaker, which is housed in the lower compartment; the access cover of the latter cannot be removed until the isolator has been opened and the isolator cannot be reclosed until the cover has been replaced. The butt contacts of the air breaker are rendered self-cleaning by their wiping action. Arcing contacts, magnetic blowouts, and arc chutes are fitted. Integral trip coils in series afford over-current protection, time-lag being introduced by oil dashpots which can be adjusted for single or double action: the second stage avoids short-time tripping when directly starting squirrel-cage motors. Earth-leakage protection can be provided for any outgoing circuit.



Flameproof 2,000-kVA air-breaker designed on the "unit" principle

mechanical tripping being induced by a polarised relay actuated from a rectifier connected to the secondary winding of a core-balance transformer of the ring type, housed in the lower compartment. An armour-plate glass window affords visual indication of the operation of the relay, which latches out, so that it can only be reset by means of an external push button on the breaker cover. Another external spring-loaded push button enables all the leakage protective gear to be tested periodically.

An under-voltage release can be added, if needed, and can additionally serve for interlocking the circuit-breaker with a motor controller, or with a socket-plug, or for remote tripping.

This type G.A.4 circuit-breaker is rated at 2,000 kVA, "proved" at from 440 to 660 V (service) and is certified flameproof in Groups I and II (firedamp and petroleum and acetone vapours).

Electric Hammer

The small electric hammer introduced some months ago by the RAWLPLUG CO., LTD., Rawlplug House, Cromwell Road, London, S.W.7, is a convenient means of drilling many small holes in either hard or soft materials, mainly for accommodating the company's well-known fixing plugs. But it can also be employed for hacking and pointing. There are several special tools; for example, for chasing slots to take conduit; chisels for raking out cement from between bricks, or for cutting slots, or chipping away superfluous material; a comb and holder attachment for putting a keying surface on brickwork.

The hammer is rated for intermittent service, but for occasional riveting work dollies are available.

COMMERCIAL and INDUSTRIAL NEWS

Lamp Cap Salvage. Census of Steel Stocks. Egyptian Trade Marks

Purchase Tax Decision

THE Commissioners of Customs and Excise announce that the types of portable lamps and hand torches liable to 33⅓ per cent. Purchase Tax under Class 7 (*c*) (*i*) include the following :—All types of head and rear lamps for pedal cycles whether fitted with handles or not ; mains-operated inspection lamps ; lamps of all types, whatever their source of power, which are normally transportable by hand and which have a maximum weight not exceeding 35 lb.

Better Factory Lighting

Leaflet No. 7, produced by the Electric Lamp Manufacturers' Association in connection with the new factory lighting regulations, sets out in detail the way in which improved illumination combats a number of wartime disabilities such as longer hours under artificial light, depression created by black-out conditions, the displacement of young workers by older men, and the entry into factories of new recruits unfamiliar with the conditions. It also shows how such requirements as faster production, efficient tool maintenance and conservation of raw materials are more easily attained if good lighting is installed. The leaflet is well illustrated with examples of good lighting.

Saving Lamp Caps

Methods of dealing with lamp caps preparatory to returning them to suppliers are detailed in a memorandum recently circulated by the Electric Lamp Manufacturers' Association, the idea being to put them once more to their proper use instead of treating them merely as scrap brass. It is first pointed out that the glass bulb has no value and should be removed to reduce bulk. The way of removing it is to grasp the lamp firmly and tap it with the sharp edge of a file to crack the glass, which is then removed piecemeal as near to the neck of the lamp as possible. Suitable precautions should be taken against flying glass, e.g., gloves and goggles should be worn.

Care should be taken not to damage the cap itself in any way and no attempt should be made to remove the glass foot which protrudes from the inside of the cap, nor should the neck of the bulb or the cement be touched. The solder contacts should also be left intact.

The caps should be packed into barrels or boxes (not sacks) and the gross weight of the package should not exceed 2 cwt. They should then be returned to any branch of any E.L.M.A. member.

Navicerts for Irish Exporters

The Ministry of Economic Warfare announces that as from January 22nd, it will be necessary for exporters in Eire to obtain Navicerts for shipments to the following countries :—Sweden, Finland, Switzerland, Roumania, Hungary, Yugo-Slavia, Bulgaria, Greece, Turkey, U.S.S.R., Spain (which includes the Balearic Isles), Spanish and International Morocco, Portugal, the Spanish and Portuguese Atlantic Islands, Portuguese Guinea, Liberia, French West Africa, the territories of Mauritania, Senegal, French Guinea, Ivory Coast and Dahomey, Syria, Madagascar, and Reunion.

For the benefit of exporters and others who are not familiar with the operation of the system, a Navicert may be explained as a form of commercial passport which will eliminate possible delays in the passage of the goods it carries through the British Contraband Control. Intending exporters will be able to apply to the United Kingdom Trade Commissioner, 69 Merrion Square, Dublin, on special forms obtainable from the Trade Commissioner's Office, and if the intended consignment is approved by the Ministry of Economic Warfare, a Navicert will be granted.

British Goods for Cyprus

A firm of engineers and merchants in Cyprus wishes to secure exclusive agencies for the colony for British manufacturers of the following goods :—Dry batteries of all kinds ; installation materials—cable, conduit, switches and fittings ; kettles, toasters, irons, fires and fans ; and electric lamps. We shall be glad to pass on to our inquirer the names of any interested concerns in this country or to give them the name of the Cyprus firm.

United States Electrical Exports

The United States Department of Commerce reports that exports of electrical equipment in October were valued at $11,969,000, against $10,519,000 in September and $10,250,000 in October, 1939. Shipments for the first ten months of 1940 aggregated $116,090,802, an increase of 27.3 per cent. as compared with the same period of 1939. Exports of radio apparatus in October amounted to $1,891,812 compared with $1,454,269 in September.

Exports of telephone equipment, including instruments and other parts, showed a 16 per cent. increase ($425,462). Rubber-covered wire shipments registered a 38.7 per cent. loss in October, reaching a new low record for the year of $144,735. Direct-current generator exports totalled $364,949 in October, which was equivalent to the total for the previous nine months of 1940. Self-contained lighting outfit exports were valued at $706,915, representing an increase of 175 per cent. on the July total of $257,122, the previous high record for 1940.—*Reuter's Trade Service.*

American Electric Refrigerator Sales

According to the National Electrical Manufacturers' Association, domestic sales of household electric refrigerators by thirteen manufacturers amounted to 82,019 units in October as compared with 57,715 for the same month in 1939, says *Reuter's Trade Service.* For the first ten months of last year, domestic sales were 2,347,157 units against 1,682,372 in January–October, 1939, and world sales 2,477,139 compared with 1,827,061, a new high record for the industry.

Electric range sales in October totalled 34,714 units against 23,611 for October, 1939 ; for the first ten months of 1940 the total was 354,365 units, compared with 264,409.

Iron and Steel Control

The Iron and Steel Control has been asked by the Ministry of Supply to take a complete census of the stocks of steel held by users. The inquiry relates to the stock position at the end of December, and a form sent out by the Control has to be completed and returned by January 11th, so that the results will be available by the middle of the month. In addition to stocks, the total receipts and consumption of steel in the last quarter of 1940 are asked for. The list of firms written to has been compiled from lists of customers of representative steel firms in each area, and although the number of firms being approached runs into many tens of thousands, some important, though not necessarily large users of steel, may have been omitted. As it is most desirable that every user of steel should be covered by the inquiry and should be on the Control's list of steel consumers, any firm that has not been written to within the first few days of January is asked to write to the Iron and Steel Control, Hemingford, Alveston, near Stratford-on-Avon, for the necessary form.

Trade Marks in Egypt

A firm of patent attorneys in Cairo has drawn our attention to an official notice issued by the Egyptian Comptroller of Patents regarding the effects of the new Trade Marks Law. This provides penalties for the use of the term "registered trade mark" in respect of any mark which has not been registered in Egypt. Registration effected abroad will not justify the use of the term nor will the fact that a trade mark has already been deposited with the Bureau of the Mixed Court of Appeal be a legal defence of such use. The notice calls upon traders, manufacturers and importers to abstain from offering goods bearing trade marks which wrongfully indicate that such marks are registered in Egypt. Our correspondents intimate that they will be glad to give further advice in the matter.

Women in Industry

Miss Caroline Haslett, the director of the Electrical Association for Women, who has recently been appointed adviser to the Ministry of Labour on Women's Training, is to read a paper on "Women in Industry" at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2., on January 15th at 1.45 p.m. Miss Irene Ward, M.P., is to preside.

Applications for Special Orders

Rule 4, Statutory Rules and Orders, 1930, No. 102, made by the Electricity Commissioners, requires an applicant for a Special Order to advertise in the public Press, among other things, particulars of the proposed area of supply, of streets not repairable by a local authority and the railways and tramways to be broken up, and of the land to be acquired for a generating station.

This requirement has been modified by Order No. 2165, of 1940, made under the Emergency Powers Defence Regulations, which enables the Electricity Commissioners to dispense with this requirement where they are satisfied the publication would be likely to disclose information of use to the enemy.

Birmingham and Exports

Despite the big change-over to wartime production the export trade of Birmingham in all its branches has been well maintained, states a Board of Trade announcement. Although to-day so much of the city's great resources and efforts has been diverted to the vitally important national service, highly successful and important measures have been adopted to maintain and add to the export branch of trade. A great deal of this is carried on now as always with the assistance of old-established and very efficient mercantile houses, particularly in connection with the South American markets, but some of the more important companies maintain their own agencies abroad and conduct business direct. While it is true that the changing map of the world has narrowed outlets for Birmingham goods, a great deal has been accomplished through the develop-

ment of Colonial and Dominion markets with which, wherever local secondary industries permitted, trade has been done on a considerable scale. On the electrical side, granaries in Argentina, mines in Africa, and harbour works in many parts of the world have been equipped by leading Birmingham manufacturers. The facilities afforded by the Export Groups are being used to the fullest possible extent and Birmingham manufacturers are alive and eager to expand business with other countries as a contribution to the nation's war effort.

Copper Alloys

A technical booklet available on request from Mallory Metallurgical Products, Ltd., 78, Hatton Garden, London, E.C.1, describes the properties and applications of the company's range of high strength, high conductivity copper alloys for castings in unusual combinations of mechanical strength, hardness and current-carrying capacity, which have been successfully applied to several different types of electrical equipment, including circuit-breakers, arc and induction furnaces and resistance welding machines. The tensile strength of castings in Mallory 3, 53 and 100 range from 22 to 45 tons per sq. in., the electrical conductivity varying inversely from 80 per cent. of that of standard copper down to approximately 40 per cent. The range thus covers materials combining lightness of section and intricacy of design with high current-carrying capacity.

Aluminium and Magnesium Alloys

Three pocket charts comparing the characteristics of light alloys of aluminium and magnesium have been prepared by the Birmingham Aluminium (1903) Co., Ltd. No. 1 relates to the mechanical and physical properties of aluminium alloys at elevated and room temperatures for pistons and for general use and of zinc-base alloys for pressure-die castings. No. 2 deals with similar characteristics at room temperatures of aluminium and electron alloys. No. 3 gives particulars of composition and heat treatment of aluminium and electron alloys. In these charts information previously given in "Birmal Technical Data" (now out of print) has been included, subject to revision due to the issue of further specifications.

Cement Works Circuit-breakers

Our attention has been drawn to the fact that the circuit-breakers illustrated on page 177 of our issue of December 27th (the article dealing with the works of the Barnstone Cement Co.) were made by the Airedale Electrical & Manufacturing Co., Ltd. We regret that we omitted to mention this in the article.

"Ironmonger" Buyers' Guide

Besides including a page-a-week diary, the *Ironmonger* "Hardware Buyers' Guide for 1941" contains a great deal of varied information of assistance to any one in any way connected with the hardware industry. There are directories of associations and controls, giving names and addresses, as well as special articles on such important matters as "Trading in Wartime," "The Prices of Goods Act," "Limitation of Supplies Order," "Purchase Tax," "Export Credits," "Distribution of Steel," and "War Risks Insurance." A number of helpful metal tables is also given, together with a classified list of trade marks, brands and special names.

Brown Brothers' Jubilee

To mark the jubilee of the well-known firm of Brown Brothers which was founded in 1889 by the four brothers, Albert, Ernest, John and Fred Brown, a souvenir brochure has been published for limited circulation entitled "Fifty Years 1889-1939." From its modest beginnings in a small shop at No. 7, Great Eastern Street, the company now possesses no fewer than twenty-four branches in various parts of the United Kingdom. While the company is probably best known in the motor, cycle and allied trades, the scope of its business has been very greatly enlarged in recent years to cover a very wide range of products. The radio and electrical departments in particular have been greatly extended during the past decade, and there has also been a great expansion in work connected with the aircraft industry.

E.I.B.A.

The Annual General Meeting of the Northern Counties Area of the Electrical Industries Benevolent Association will be held on Monday, 27th January, 1941, at 2.0 p.m. at Tilley's Restaurant, Blackett Street, Newcastle-upon-Tyne, 1, under the chairmanship of Mr. E. J. Edgar.

Alex. Hawkins & Sons

Alex. Hawkins & Sons, 125-128, London Road, Southwark, S.E.1., electrical engineers and contractors, have (after trading for nearly 100 years) converted the business into a private limited liability company under the name of Alex. Hawkins & Sons, Ltd. There will be no change in management. The present partners Mr. H. Hawkins and Mr. F. J. Hawkins, A.M.I.E.E. are managing directors, and three of the staff have been appointed directors of the new company. They are Mr. E. Brindley, electrical department), Mr. C. F. James (blind-makers and general departments), and Mr. R. Stevenson (contract department). Mr. K. T. Hawkins will join the board when he returns from his military duties.

Calendars and Diaries

Mr. George Barnard of Tarmac, Ltd. has sent us a convenient-sized pocket diary with an attractive imitation lizard skin cover, and also a calendar refill with monthly sheets.

We have received a very useful calendar with a slip for each day inscribed with a suitable motto, from Revo Electric Co., Ltd.

The calendar of C. A. Parsons & Co., Ltd., has three months on a sheet, and each sheet illustrates plant supplied by the company to power stations in England and the Dominions.

The Portable Furnace & Patents Co. has sent us a neat engagement calendar with monthly sheets.

A refill for their engagement pad has been received from the Hackbridge Electric Construction Co., Ltd., and the Hewittic Electric Co., Ltd.

We have again received from B. S. & W. Whiteley, Ltd., a handy desk calendar with daily slips, each of which bears a quotation.

The calendar of the Davenport Engineering Co., Ltd., has weekly slips mounted on a card illustrating the company's cooling towers.

Price Increase

Heyes & Co., Ltd., announce that owing to increased production costs, the prices of their products have been advanced by an additional 8⅓ per cent., making with the existing advance, a total increase of 33⅓ per cent.

Catalogues and Lists

A. G. Hackney & Co., Ltd., Fairfield Pottery, Robson Street, Hanley, Stoke-on-Trent.—Illustrated and priced catalogue of low-voltage porcelain products, such as ceiling roses, lampholders, cable cleats, racks, bobbins, reels, connectors, meter board bushes, lead-in tubes, etc.

Portable Furnace & Patents Co., Carrington, Nottingham.—Descriptive price lists illustrating portable paraffin blast furnaces for heating compounds and soldering materials used by cable jointers and plumbers, or for melting resin-oil cable compound, and larger equipment for heating and drying road surfaces.

Sumo Pumps, Ltd., Lighthouse Works, Smethwick, Birmingham.—Illustrated technically descriptive list (CE1), price list (HbEP) and printed inquiry form (EE1) for submersible AC motor pumps for suspension in deep wells or boreholes below water level.

Trade Announcements

T. M. C.-Harwell (Sales), Ltd., 233, Shaftesbury Avenue, London, W.C.2, inform us that they have come to an arrangement with Wades (Metal Spinners), Ltd., of Halifax, to distribute and act as sole agent for their industrial lighting equipment.

J. A. Crabtree & Co., Ltd., announce the appointment of the West African Electrical Co., Bank Buildings (P.O. Box 8), Sekondi, Gold Coast Colony, as their agents for the Gold Coast and Nigeria.

Changes of Address

The Jeary Electrical Co., Ltd., asks manufacturers to send a statement showing the position of their account for the past few months, and also copies of outstanding orders, together with catalogues, to the company's temporary address in Errol Street, London, E.C.1.

Leonard Toomer & Co., Ltd., wholesale electrical suppliers, ask for catalogues, price lists and quotations, to be sent to their new address at Plantation House, Fenchurch Street, London, E.C.3 (telephone: Mansion House 1841).

The Armorduct Cable Co., Ltd., has moved to 256, Westminster Bridge Road, London, S.W.1. The telephone number is unchanged.

Fernand Espir, Ltd., are now at 4, Frithwood Avenue, Northwood, Middlesex. (Telephone: Northwood 2457).

The London office of Gilby-Brunton, Ltd., has been transferred to 3, Inglewood Road, Hampstead, N.W.6 (Telephone: Hampstead 3938).

Crewe Allen & Co., have removed to 7, Epworth Street, City Road, E.C.1, and ask for catalogues, copies of December invoices, etc.

The Bristol branch of the Wholesale Fittings Co., Ltd., has been reopened at 53, Frogmore Street, Bristol, 1.

L. E. Wilson & Co., Ltd., have moved to temporary premises c/o Barber & Colman, Ltd., Marsland Road, Brooklands, Sale, Manchester. (Telephone: Sale 2277).

Supervisors' Luncheon

The Executive Council of the Association of Supervising Electrical Engineers has decided to hold a luncheon on Saturday, February 22nd, at the Connaught Rooms, W.C.2, when the president, Mr. H. W. Swann, M.I.E.E., will preside. Tickets, 9s. 6d. each, may be obtained from members or from the A.S.E.E., Aldwych House, W.C.2.

Junior Institution of Engineers

To-morrow (Saturday) an ordinary meeting of the Junior Institution of Engineers is to be held at 29, Victoria Street, S.W.1, when a paper will be read by Messrs. F. H. Whatton and T. Hall on "Electrical Wiring Regulations and their Application." The Midland Section, meeting at the James Watt Memorial Institute, Birmingham (also to-morrow), will hear a paper on "Some Problems of Electricity Distribution" by Mr. D. Birch.

Illuminating Engineering Society

A paper by Mr. W. D. Wright entitled "The Fundamental Principles of Vision in Very Weak Light" and a report on "Wartime Street Lighting and Aids to Movements in Streets—a Study of Fundamental Requirements," with demonstrations, are to form the programme for a meeting of the Illuminating Engineering Society next Tuesday at 2.30 p.m. at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, W.C.2.

PROSPECTS IN MEXICO

Changes brought about by the War

From a Correspondent in Mexico City

THE use of electric power in Mexico is of prime importance in view of the expense of transporting coal. The elevation of the land and the narrowness of its coastal plains create falls and rapids which could be developed as sources of water power. The flow of the Mexican streams is intermittent, necessitating extensive reserves.

There are at present some 11,059 power plants, with a total capacity of 630,000 kW. Of these plants 396 produce power for commercial use; there are 424 private plants, the others being mixed. Sixty per cent. of the commercial power is handled by the Compania Mexicana de Luz y Fuerza Motriz, S.A., associated with the Mexican Light and Power Company. Another 25 per cent. is distributed by the various companies controlled by the Empresas Electricas Mexicanas.

Standards for installations and wiring are high, being controlled by the Seccion de Control Electrico of the National Economy Department. The specifications are largely based on those in Wisconsin, U.S.A. At present Mexican plant is insufficient for the needs of the country. Because of the overload conditions prevailing, manufacturers of equipment for this market should, where feasible, equip apparatus with thermal releases. This applies particularly to refrigerators and washing plants.

Imports of motors and generators are classified by weight. The prices of United States fractional-HP motors have in the past been competitive with German and Swedish makes, but as regards motors ranging from 3 to 20 HP the Swedish prices have been considerably lower than offers from North America. Recently generators were sent from Sweden *via* Russia owing to the difficulty of shipping direct across the Atlantic and yet they were landed cheaper than those from American firms. Now that the German competition, largely A.E.G. and Siemens, has been eliminated by the war, the United States seems to have a fairly clear field except in the types of machines supplied by Sweden.

The disappearance of Germany from the market and other factors arising from the war have altered conditions and prospects in Mexico. Although competition has slackened somewhat buyers are inclined to be cautious

Storage batteries are manufactured, production being protected by a substantial customs duty. In the automotive field the market for batteries is completely controlled by Mexicans. On the other hand storage batteries for industries and farm lighting sets are imported. Zinc and copper plates come largely from the United States. Containers for dry-cell batteries are also of American origin. The leading manufacturers of dry batteries are the National Carbon Ever-Ready, S.A., and the Bond Electric Corporation of Mexico, S.A. Accumulators are manufactured in Mexico by four firms. Germany used to supply a quantity of carbon electrodes for batteries.

Cheap Accessories

The United States and Canada in the past have controlled the trade in electrical measuring instruments. Imports of portable electric tools, battery-charging motor-generator sets, arc welding sets and similar equipment are of American origin. The quantities imported cannot be ascertained as they are not mentioned in the Mexican statistics. Up to the beginning of the war Germany competed in supplying switches, sockets, plugs, fuses and receptacles. In some of these items Japan has made headway; in fact, in accessories of synthetic material Japan has the lead in Mexico, its prices being 50 per cent. below North America's, but the quality is rather poor. Japan is now making an effort to obtain the market in Mexico for household wiring devices. These Japanese goods are handled generally by small importers and retailers. The bulk of consumers consider only first cost, disregarding lasting qualities. Maintenance is sadly neglected in Mexico.

Germany controlled the business in electric bells and accessories before the war. Japan, also a supplier, is now seeking to obtain the German share. The bulk of X-ray equipment is American. Just before the war Germany made serious inroads in this line, the prices being at least 10 per cent. lower. In sun-lamps the United States has always predominated. Violet-ray equipment is now wholly of American origin, the German goods having disappeared from the Mexican market.

About 2,500,000 filament lamps, each weighing up to 5 grammes ($\frac{1}{6}$ ounce approximately) are imported annually. Japan supplies an increasing proportion. Before the war Germany made progress in this trade, as in all electrical lines, by its bartering agreements and other means. Although Mexico has three organisations making incandescent lamps, protected by a high duty, apparently Japan can still sell at prices lower than the domestic product. In larger lamps of the same type the United States leads. Japan is now increasing its efforts in order to obtain mercury, scrap iron and petrol from Mexico. The arc-lamp trade is small and is controlled by American manufacturers. This applies also to gas-discharge or mercury-vapour lamps.

Germany was an important supplier of "wire of common metals and alloys thereof, insulated but not armoured," over half the Mexican imports coming from that country despite strong competition of the United States. Imports of armoured wire of this type are less; these formerly came from Italy and Germany as well as America. There are large imports of cable, armoured and unarmoured. Germany was formerly the chief source, and Canada has now taken a share of the trade. Underground cables seem to be almost entirely supplied by one American manufacturer. It is reported that shortly there will be a large demand for cable for improved airport lighting as part of the Pan-American defence scheme.

Besides the Consolidada there are four other local factories making wire. Lighting flexible is also made, but Japan is the principal foreign source. Conduits, which formerly came from Germany, are likewise manufactured in Mexico. American prices are 25 per cent. higher than the domestic. The best opportunity is in the heavier conduit and fittings. These are used in Mexico's many mines, which need absolutely reliable material.

Investment Discouraged

At the moment political conditions in Mexico do not tend to encourage heavy investments in plant. Purchasers of electrical generating equipment limit most of their purchases to replacements rather than providing for extensions. The expropriation of the private oil properties by the Mexican Government has diverted foreign capital for electrical exploitation to other fields, to some considerable extent.

Just before the outbreak of war Germany was a keen competitor of the United States in power-plant equipment. But at present the latter country very considerably controls the market. Chief among the reasons for this is the nearness of the two countries. Moreover, Mexican engineers are trained on American lines and are familiar with American engineering specifications. It may be noted that not only standards established by the American Institute of Electrical Engineers but also those of the British Standards Institution can be used. The Compania Mexicana de Luz y Fuerza Motriz, S.A., issues its own specifications, which may be obtained from the company on request.

Before the war Germany could undersell the United States in small generators up to 250 kVA. Sweden has been and is still, despite transportation difficulties, the supplier of lowest-priced transformers, particularly those rated at from 25 kVA to 200 kVA. For large transformers quotations by the Swiss firm of Brown-Boveri were lowest. These large transformers, however, are not now being received from Switzerland owing to the war. Manufacturers who can compete with American firms find Mexico an interesting but somewhat limited market. A cautious attitude is adopted by local buyers in view of world conditions.

ELECTRICITY SUPPLY

More Annual Reports. Overload at Bristol. Shelter Lighting Schemes

Aberdeen.—DEFERRED CONSTRUCTION.—The Electricity Committee has decided to ask the Electricity Commissioners for permission to proceed with work already sanctioned but deferred owing to the war. It was proposed originally to erect a 6,000-kW substation at a cost of £15,770, but it is now considered necessary to proceed with the installation of only half the capacity. The cost is now estimated at over £13,000.

Ashton-under-Lyne.—INCIDENCE OF PRICE INCREASE.—At a recent meeting of the Town Council reference was made to the increased electricity charges which became operative on December 12th. It was stated that owing to the method of meter reading some consumers were being asked to pay an increase on four months instead of on three; about 780 consumers were affected. In other cases consumers were being asked to pay on only two months instead of three. Arrangements were being made for refunds.

Bexhill.—SUPPLY TO GAS COMPANY.—The Corporation Electricity Committee has approved terms for the provision of an auxiliary power supply to the Hastings Gas Co.

Blackburn.—HEATING OF LIBRARY.—Alternative tenders for steam, electricity and gas are to be obtained for the central heating apparatus at the Central Library.

INCREASED REVENUE.—The revenue of the Electricity Department last year exceeded that of the previous year with a total of £312,486 and there was a net profit of £9,778. After charging £7,282 for renewals and extensions the balance has been added to the accumulated surplus which now stands at £79,215.

Blackpool.—DEARER ELECTRICITY.—Increased charges for electricity, involving an extra 5 per cent. on all accounts, are proposed at Blackpool from the beginning of the June quarter. The step is necessitated through the increased price of coal, higher overhead charges and lower revenue.

Bristol.—CHRISTMAS BREAKDOWN. — The electricity supply failed in a number of districts in Bristol on Christmas Day, just as the Christmas dinners were being prepared. An official statement made later said that the trouble was entirely due to overloading. Since the heavy raids on Bristol, consumers have been urged to refrain from using electricity for heating or other purposes from heating points between 7 a.m. and 2 p.m. Nearly everyone seems to have ignored this appeal on Christmas morning and the breakdown was unavoidable. It was, however, of short duration and did not affect every district in Bristol.

Burnley.—EMERGENCY EQUIPMENT.—The General Purposes Committee has approved a proposal that the Electricity Committee should expend £3,300 upon various spare equipment for use in case of emergency.

Cheltenham.—RESTRICTED-SUPPLY HOURS.—The borough electrical engineer recently reported that owing to the extension of summer-time throughout the winter, it was probable that the maximum load of the undertaking would be experienced during the morning instead of the evening as hitherto. He therefore recommended that the hours of operation of the restricted supply should be from 7.30 a.m. to 10 a.m. and from 4.30 p.m. to 7 p.m. G.M.T. (8.30 a.m. to 11 a.m. and 5.30 p.m. to 8 p.m. B.S.T.), instead of as at present from 3 p.m. to 7 p.m. This recommendation has been approved by the Electricity Committee.

Chichester.—INCREASED CHARGES.— In consequence of further increases in the cost of generation, a war surcharge of 7½ per cent. is to be added to all electricity charges (including meter rents and standing charges under the two-part tariff) in respect of electricity consumed after the December meter readings.

Clitheroe.—SUPPLY ARRANGEMENTS.—An application for a supply of electricity for industrial purposes at Horton, partly in the Clitheroe area of supply and partly in that of the Yorkshire Electric Power Co., has been rejected by the Clitheroe Town Council, which thinks that a supply by the Power Co. is preferable under the circumstances. The Council is, however, affording a supply of electricity to Eaves Hall, and has agreed to make an offer for the purchase from Mr. E. M. Fattorini of his electricity undertaking at Sawley.

Colne. — BORROWING RESTRICTED. — Following the application of the Town Council for consent to borrow £3,624 for unspecified mains and services, the Electricity Commissioners have agreed to loans to the extent of £1,500 only.

Corby.—SHELTER LIGHTING.—Most of the town's large aid-raid shelters are equipped with storage batteries to provide lighting, but as this has been found unsuitable, the Urban District Council is to obtain mains transformers to replace them.

Darlington.—STREET LIGHTING DECISION.—The Streets Committee has rejected proposals for introducing "starlighting" in further streets in the town.

Douglas (Isle of Man).—NEW CABLE.—The Corporation Electricity Department is to proceed with the laying of the cable between North Quay and the Summer Hill substation, at an estimated cost of £3,500.

Dundee.—METERING SHELTER SUPPLIES.—At its last meeting the Electricity Committee agreed to a request by the convener of the Emergency Committee that separate meters should be dispensed with for lighting in domestic shelters, so that the installation would be cheapened and the work done more quickly. It was agreed that the work should proceed at once.

Durham. — SCHOOL LIGHTING. — The County Education Committee is to install electric lighting at Stanhope Council School at a cost of £82.

Edinburgh.—SHELTER LIGHTING.—Electric lighting has now been installed in public shelters having a total capacity for 314,000 persons.

Erith.—A SATISFACTORY YEAR.—Despite the reduction in sales of electricity due to the loss of street lighting and to the evacuation of householders, the output of the electricity undertaking increased during the year ended March 31st last from 32.4 million kWh to 34.5 million kWh. This, Mr. E. A. Logan, the borough electrical engineer and manager, states in his report, may be accounted for partly by the increase in the number of consumers from 11,536 to 12,167, by the continuing increase in the use of electric cookers and water heaters, and only to a small extent by increase in factory consumption. The rate of increase of consumers showed a falling off compared with recent years, and this may be attributed to the reduction in the number of new premises being completed due to the slowing down in building, as a result of the occupation of available building land. At the end of the year the number of cookers and water heaters on hire was respectively 4,616 and 2,804. Taking into account the number of consumers who are purchasing or have purchased their own cookers, this means that every second householder in Erith now cooks by electricity. The total revenue of the undertaking rose from £112,166 to £122,438. There was, however, a net loss amounting to £6,380.

Fareham.—YEAR'S RESULTS.—During the year ended March 31st last the undertaking made a gross profit of £5,434, against £2,363 in 1938-39 and the net loss fell from £3,914 to £33. A sum of £1,499 was spent out of revenue for capital purposes. During the year a refund dating back to the beginning of 1937 was received on account of bulk supplies.

Harrogate.—LOAN APPLICATION.— The Town Council is applying for sanction to borrow £5,000 for unspecified mains and services.

Hitchin.—LOSS ON WORKING.—When the Electricity Committee reported a loss of £4,682 on the undertaking for the year 1939-40 at a recent Council meeting, a motion to appoint a sub-committee to investigate the working of the Electricity Department was defeated. The principal reason for the loss was stated to be substantial increases in the maximum demand charge and payments under the coal clause of the bulk supply agreement. Moreover, a new system of meter reading caused a delay in the receipt of revenue; this was merely a book loss, but if it had not occurred and if the increased prices had operated for the full year the deficit would have been only about £460.

To minimise the probable loss during the current year the Committee recommended that the unit charge under the "all-purpose" rate should be raised from ⅝d. to ¾d. in the winter quarters, that the fixed weekly charge to Council houses should be increased, and that there should be a general addition of 10 per cent. to all other accounts except those subject to coal clauses.

Hornsey. — TARIFF FOR "ELECTRICS."—To meet the requirements of a local firm which has decided to use electric vehicles, the Electricity Supply Committee has instituted a special tariff for vehicle charging supplies. It consists of a standing charge of £2 15s. per kW, plus ½d. per kWh, plus 25 per cent. war increase.

Huddersfield.—SHELTER LIGHTING.—Approval has been received from Ministry of Home Security to the provision of electric lighting in twenty-one communal shelters.

TRACTION SUBSTATION.—An additional rectifier substation is to be erected in connection with the traction supply. The Passenger Transport Committee has agreed, without establishing a precedent, to pay £750 towards the cost of the necessary equipment.

AIR-RAID SIRENS.—Subject to Ministry of Home Security approval, electric sirens, operated by the Ripplay system, are to replace existing steam ones.

Isle of Thanet.—INCREASED CHARGES.—The Isle of Thanet Electric Supply Co., Ltd., announces that, owing to increased costs and greatly reduced consumption of electricity, an increase of 33⅓ per cent. (in lieu of the present 15 per cent.) will be added to all electricity accounts as from the meter readings commencing with the first quarter

of 1941. No addition will be made to meter rents or to hire charges.

Kettering.—INCREASED CHARGES FORESHADOWED.—The chairman of the Corporation Electricity Committee stated at a recent Council meeting that increases in coal costs and coal transport charges during the past nine months were far greater than anticipated and in a full year would amount to approximately £6,000. A part of this increase had been allowed for in the costs for the current financial year, but there was still £3,000 extra to find. The Committee thought it better not to increase the charges further during the coming March quarter, although it was certain to lead to a deficit as against a very small profit estimated. Charges would, however, certainly have to undergo a further increase after the end of the March quarter.

Letchworth.—ELECTRICITY SUPPLY PROGRESS.—In the course of his speech to shareholders at the annual meeting of First Garden City, Ltd., Mr. E. MacFadyen said that over 27 million kWh of electricity was sold during the past year, and consumption had doubled in the last six years. Substantial outlays had to be incurred on safeguarding continuity of supplies, and higher fuel costs had to be faced, to cover which a small increase in charges was necessary.

London.—BATTERSEA.—Except in the case of existing agreements, the all-in domestic tariff is to be suspended until further order.

HACKNEY.—A Bastian & Allen electric boiler is to be installed by the Borough Council Health Committee at the disinfecting station at an estimated cost of £900.

STEPNEY.—The Borough Electricity Supply Committee reports that for the period from April 1st to September 30th, 1940, the output of electricity was 45,481,730 kWh, as compared with 52,791,897 kWh for the corresponding period of 1939, equivalent to a reduction of 15.6 per cent. This serious decline is stated to be due to war conditions, the restrictions on capital expenditure and the cessation of public lighting. In addition the evacuation from the borough, which has progressed almost continuously since the outbreak of war, has considerably affected the sales of electricity.

Lytham St. Annes.—LOSS ON SUPPLY UNDERTAKING.—Last year the electricity undertaking showed a net loss of £2,349, against a net profit of £550 for the previous year. Income totalled £100,262, £94,348 being from sales to private consumers, while expenditure amounted to £67,857, leaving a gross profit of £32,405. Interest, sinking fund and bank charges accounted for £34,800.

Nelson.—ANNUAL REPORT.—The report of the engineer and manager of the Electricity Department (Mr. T. Dawson Martin, A.M.I.E.E.) for the year ended March 31st last shows an increase of about 10 per cent. in sales of electricity to 12,922,000 kWh; there was a rise of almost 19 per cent. in sales under the "all-electric" tariff. Actually over 28 million kWh was purchased from the Central Electricity Board, but about 14,682,492 kWh was "retailed" to other authorised distributors. The total revenue rose from £114,872 to £119,734 and the working expenditure from £109,661 to £115,387. The net profit was £4,347, against £5,211.

Mr. Martin notes that "the rural electrification scheme has been an unqualified success during the year under review both from the point of view of continuity of supply and financially from the units consumed. Quite a number of farmers are now using electricity for sterilising purposes in milk production and in this way a useful service is being rendered to the community."

Newark.—UNEXPENDED SANCTIONS.—Application to be made to the Electricity Commissioners for consent to exercise unexpended sanctions on plant, mains, services, buildings, apparatus and assisted wiring schemes.

Otley.—ELECTRIC LIGHTING ACCOUNT SETTLEMENT.—It was reported at a recent meeting of the Urban Council that an offer by the Electrical Distribution of Yorkshire, Ltd., to give the Council a credit of £774 in respect of the electric lighting account for the year ended September last had been accepted. Otley is one of a number of West Riding authorities involved in a dispute with the company over lighting accounts. It was stated that the credit represented a saving to the Council of 36 per cent. in a full year.

Paisley.—SUSPENSION OF HIRE-PURCHASE SCHEME.—The Electricity Committee has recommended the suspension during the war of the hire-purchase of domestic appliances and electrical installations.

Salford.—PUBLIC SHELTER HEATING.—The Town Council has decided to provide tubular electric heaters in public shelters.

Scunthorpe.—A METER QUESTION.—The borough electrical engineer has drawn the Electricity Committee's attention to the substantial rise in the cost of prepayment meters and has suggested that these meters should only be provided in special cases, ordinary meters being generally installed. The engineer has been authorised to purchase only ordinary meters during the next three months and has been asked to report upon the matter again at the end of that period.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £4,516.

Shipley.—LOAN SANCTIONED.—Sanction to borrow £3,000 for mains and services has been obtained by the Urban District Council Electricity Committee.

Wallasey.—PURCHASE TAX ON HIRE-PURCHASE GOODS.—Having considered the method to be adopted for the payment of the Purchase Tax by purchasers of appliances sold on the hire-purchase system, the Corporation Electricity Committee recommends that a sum equivalent to the tax should be paid at the time of the signing of the hire-purchase agreenent in addition to any other sum then payable.

Uttoxeter.—The annual report of the Electricity Department, just issued, states that the number of kWh sold for the past year was 3,480,897 and the income for energy was £18,445 (1.22d. per kWh). Few undertakings, states the electrical engineer, Mr. A. McGregor, comparable in size with Uttoxeter can improve on this.

Transport

Australia. — MELBOURNE TRAMWAYS. — Revenue totalling £2,431,634 was earned by the undertakings of the Melbourne & Metropolitan Tramways Board in the year ended June 30th last, as compared with £2,320,226 in the preceding year. The surplus on operation amounted to £833,141, of which the electric tramways contributed £745,601, the cable tramways £34,713 and the motor buses £52,827. After meeting interest and other charges there was a net surplus of £535,754 (against £506,118). The capital invested in the undertakings totals £8,749,802. It had been decided to convert the Clifton Hill and Nicholson Street cable trams to motor-bus operation last March, but in order to conserve petrol the changeover has been deferred until the cable ropes are no longer usable. The report records the death of Mr. A. Cameron, the pioneer of electric tramways in Melbourne and Chairman of the Board from 1919 to 1935.

Coventry.—TRAM SERVICES TO BE DISCONTINUED.—The City Council has decided, subject to the necessary approval of the traffic authorities, to discontinue the remaining services of tramways at Coventry and to replace them by bus services.

Eston (Yorks).—TRACTION BOARD SOLVENT.—It was reported at a meeting of the Urban District Council that the Teesside Railless Traction Board with which the Council is associated is now running solvent. Councillor P. McPartlan, who is chairman of the Board, said that the Board had gone through trying times by reason of its limited routes and services, but it was now carrying about 3½ million passengers a year.

Huddersfield.—TROLLEY BUS ORDERS.—The passenger transport manager is to obtain quotations for the supply of fourteen trolley vehicle chassis and double decker bodies. This is in connection with a recommendation to give an order for the purchase of fourteen vehicles, to be delivered as soon as possible after the war.

Lytham St. Annes.—MANAGEMENT OF UNDERTAKINGS.—The Corporation has considered recommendations from Electricity and Transport Committees regarding a proposed separation of the management of the two undertakings. Consideration of the matter has been deferred until after the war. Meanwhile the transport manager is to be authorised to delegate additional executive powers to his chief assistant.

South Africa.—CAPE TOWN.—The Corporation Transport Committee reports that the authorities concerned have agreed to a proposal for extending the trolley bus system to Milnerton and Bellville.

Southern Railway.—ELECTRIC LINES AND AIR-RAIDS.—In the course of an article on the running of the Southern Railway during air-raids and the restoration of services after damage to lines, *Modern Transport* says that somewhat as was anticipated the railway has suffered little inconvenience from the high proportion of electrified lines. Where electric current distribution has been damaged it has in most cases been accompanied by disruption of the track, although in one or two instances it has actually been necessary to limit trains to running on full series to avoid drawing too large a current through temporary supply facilities. Ample provision has, however, been made for the resumption of steam working if serious interference with the electricity supply should take place.

On one or two occasions when electrified main lines have not been available steam trains have of necessity been supplied to traverse alternative non-electrified routes. Up to half a dozen trains can be sent up from the electrified coast area before the stock outside the electrified area has to be drawn upon, so that reliance can always be placed upon the principal morning services being started at the right time.

Radio and Telephony

Peru.—MARCONI CONTRACT.—*Reuter* reports from Lima that the Peruvian Government is "studying" the cancellation of its contract with Marconi's Wireless Telegraph Co., Ltd., "with a view to the liberation of the Peruvian postal, telegraph and wireless system." The contract is due to expire next year. It is understood that the Marconi Company might be willing to agree to terms with the Peruvian Government if the compensation offered were sufficiently attractive, but does not regard the proposal very seriously at present.

Switzerland.—BROADCASTING PROGRESS.—During the year 1939-40 the number of wireless licence holders in Switzerland increased by 41,600, 14.1 per cent. of the population now being wireless listeners. The Swiss short-wave broadcasting service is developing in a highly satisfactory manner, and 350 overseas broadcasts were made against only 88 the previous year.—*Reuter's Trade Service.*

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *can be obtained from the Patent Office,* 25, *Southampton Buildings, London, W.C.*2.

1939

935. "Automatic steering gear." General Electric Co., Ltd., and B. Chance. January 11th, 1939. (530437.)

5423. "Insulating material." A. E. Edwards. February 17th, 1938. (530369.)

7078. "Apparatus for X-ray or visual examination." E. A. J. Tunnicliffe and Siemens-Schuckert (Great Britain), Ltd. March 3rd, 1939. (530370.)

10131. "Radio direction-finding apparatus." S. Smith & Sons (Motor Accessories), Ltd., and F. W. Meredith. March 31st, 1939. (530509.)

11134. "Ultra-violet microscopes." M. Von Ardenne. April 13th, 1938. (530568.)

13214. "Luminescent materials and combinations therewith of sources of radiation adapted to excite the materials to luminescence." General Electric Co., Ltd., A. H. McKeag and H. P. Rooksby. May 3rd, 1939. (Addition to 495706, 509857, 509858, 519157, 522607 and 525379.) (530510.)

13616. "Electric cables." British Insulated Cables, Ltd., and H. B. Chapman. May 6th, 1939. (530512.)

13937. "Synchronous electric motors." S. Smith & Sons (Motor Accessories), Ltd., and V. J. S. Russell. May 10th, 1939. (530439.)

14078. "Electric lighting fittings." British Thomson-Houston Co., Ltd., and L. Hubble. May 11th, 1939. (530441.)

14132. "Telephone systems." J. E. Pollak (Associated Telephone & Telegraph Co.). May 11th, 1939. (530443.)

16361. "Electric discharge lamps." British Thomson-Houston Co., Ltd., and W. T. Cowhig. June 3rd, 1939. (530376.)

16438. "Synchronising systems and methods." A. A. Thornton (Philco Radio and Television Corporation). June 5th, 1939. (530378.)

16593. "Prepayment mechanisms." Sangamo Weston, Ltd., and G. E. Weston. June 6th, 1939. (Addition to 492649.) (530380.)

16804. "Wide-band amplifiers." A. A. Thornton (Philco Radio & Television Corporation). June 8th, 1939. (530319.)

16959. "Vapour generators." Babcock & Wilcox, Ltd. June 9th, 1939. (Addition to 526825.) (Cognate application, 16960/39.) (530325.)

16973. "Arrangements for measuring distance between two objects particularly for depth sounding." Standard Telephones & Cables, Ltd., and L. T. Hinton. June 9th, 1939. (530326.)

16976. "Electron discharge apparatus." Standard Telephones & Cables, Ltd., and W. T. Gibson. June 9th, 1939. (530327.)

17014. "Controllable electrical delay arrangements for recurrent waves." Marconi's Wireless Telegraph Co., Ltd., and D. L. Plaistowe. June 9th, 1939. (530519.)

17115. "Deflection coils for cathode ray tubes." Telefunken Ges. für Drahtlose Telegraphie. June 11th, 1938. (530523.)

17262. "Filter circuits for rectified alternating current." A. A. Thornton (Philco Radio & Television Corporation). June 13th, 1939. (530573.)

17264. "Road traffic control systems." Siemens & General Electric Railway Signal Co., Ltd., and N. Herwald. June 13th, 1939. (530332.)

17274. "Electric conductors and the manufacture thereof." Solution Trust, Ltd. June 16th, 1938. (530574.)

17277. "Receiving systems for alternating current telegraphy." Telefonaktiebolaget L. M. Ericsson. June 14th, 1938. (530575.)

17278. "Receiving apparatus for alternating-current telegraphy." Telefonaktiebolaget L. M. Ericsson. June 14th, 1938. (530576.)

17284. "Insulation of electric cables or apparatus." Standard Telephones & Cables, Ltd., T. R. Scott and A. J. Warner. June 13th, 1939. (530577.)

17286. "Adjustment devices for radio receivers." Kolster-Brandes, Ltd., and P. A. Tiller. June 13th, 1939. (530578.)

17296. "Apparatus for short-wave therapy." C. H. Walker and Metropolitan-Vickers Electrical Co., Ltd. June 13th, 1939. (530528.)

17330. "Telephone systems." R. Mercer. (Associated Electric Laboratories, Inc.). June 13th, 1939. (Convention date not granted.) (530585.)

17496. "Snap action electrical switches." R. I. Bagnall and Foster Transformers & Switchgear, Ltd. June 15th, 1939. (530586.)

17618. "Automatic telephone systems." Electrical Research Products, Inc. June 17th, 1938. (530451.)

17840. "Coating vitreous surfaces with luminescent materials." General Electric Co., Ltd., L. F. Britten, H. G. Jenkins and A. H. McKeag. June 19th, 1939. (Cognate application, 25825/39.) (530531.)

17841. "Electrical contactors or other apparatus having pivoted current carrying arms." General Electric Co., Ltd., and H. J. C. Davies. June 19th, 1939. (530452.)

18104. "Gas blast electric circuit-breakers." British Thomson-Houston Co., Ltd., and H. E. Cox. June 21st, 1939. (530338.)

18107. "Electric heating resistances." British Thomson-Houston Co., Ltd. (General Electric Co.). June 21st, 1939. (530339.)

18163. "Echo sounding systems." Atlas-Werke Akt.-Ges. July 8th, 1938. (530350.)

18169. "Electrical fuses." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and W. E. Hill. June 22nd, 1939. (530352.)

18171. "Boxes or covers for electrical apparatus." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and W. E. Hill. June 22nd, 1939. (530353.)

18172. "Ironclad switches." J. A. Crabtree & Co., Ltd., H. F. McLoughlin, and W. E. Hill. June 22nd, 1939. (530354.)

18211. "Re-closing mechanism for electric circuit-breakers." General Electric Co., Ltd., and F. J. Keeley. June 22nd, 1939. (530360.)

18236. "Electric cable system." British Insulated Cables, Ltd., and W. Holttum. June 22nd, 1939. (530404.)

18245. "Mercury vapour lamps." Elektricitätsges. Sanitas. June 22nd, 1938. (Cognate application, 18246/39.) (530405.)

18250. "Radio antennæ." Marconi's Wireless Telegraph Co., Ltd. July 28th, 1938. (530406.)

18251. "Radio and like systems." Marconi's Wireless Telegraph Co., Ltd. July 30th, 1938. (530407.)

18253. "Electron multipliers." Marconi's Wireless Telegraph Co., Ltd. July 30th, 1938. (530408.)

18254. "Television transmitting tubes." Marconi's Wireless Telegraph Co., Ltd. July 30th, 1938. (530409.)

18257. "Electrical remote control systems suitable for use for the remote adjustment of radio receivers and for like purposes." Telefunken Ges. für Drahtlose Telegraphie. June 24th, 1938. (530410.)

18288. "Arc discharge rectifiers." Patentverwertungs-Ges. Hermes. June 22nd, 1938. (530416.)

18349. "Automatic control system for television receivers." Hazeltine Corporation. July 27th, 1938. (530426.)

18378. "Control systems employing light sensitive electric valves." British Thomson-Houston Co., Ltd. June 23rd, 1938. (530456.)

18379. "Electric transformers." British Thomson-Houston Co., Ltd. (Tokyo Electric Co.). June 23rd, 1939. (530457.)

18380. "X-ray tubes." British Thomson-Houston Co., Ltd. (General Electric Co.). June 23rd, 1939. (530458.)

18385. "Electric lamps." Siemens Electric Lamps & Supplies, Ltd., J. N. Aldington and A. J. Meadowcroft. June 23rd, 1939. (530459.)

18393. "Elastic-fluid generators." British Thomson-Houston Co., Ltd. June 25th, 1938. (Cognate application, 18394/39.) (530461.)

18451. "Air-conditioning apparatus." British Thomson-Houston Co., Ltd. June 24th, 1938. (530470.)

18484. "Method of, and apparatus for, obtaining cross-sections of bodies by means of X-rays." Philips Lamps, Ltd. June 27th, 1938. (530477.)

18521. "Sound translating devices." Electrical Research Products, Inc. June 30th, 1938. (530483.)

18551. "Means for obtaining a variable DC voltage from an AC source." A. Arvidson and Allmänna Svenska Elektriska Aktiebolaget. June 26th, 1939. (530490.)

18553. "Thermionic electrodes, more particularly for electric discharge lamps." General Electric Co., Ltd., J. N. Bowtell and H. G. Jenkins. June 26th, 1939. (530491.)

18555. "Optical systems comprising reflectors and linear light sources." General Electric Co., Ltd., S. S. Beggs and E. R. Thomas. June 26th, 1939. (530492.)

18580. "Straining apparatus for elastic fluids." British Thomson-Houston Co., Ltd. June 25th, 1938. (530498.)

18597. "Mounting of electric motors in domestic apparatus." Electrolux, Ltd. July 13th, 1938. (Cognate application, 18598/39.) (530501.)

18647. "Cable for use in alarm systems." W. G. Holmes. June 27th, 1939. (530538.)

18649. "Electrical systems for automobiles." F. Porsche. June 30th, 1938. (530540.)

18673. "Refrigerating apparatus." Ingersoll-Rand Co. July 14th, 1938. (530547.)

18687. "Radio blind landing systems." Standard Telephones & Cables, Ltd., and L. T. Heaton-Armstrong. June 27th, 1939. (Addition to 524526.) (530550.)

18688. "Electron discharge devices." Standard Telephones & Cables, Ltd. August 11th, 1938. (530551.)

18697. "Electrical switches, particularly switches of the ironclad or enclosed type." R. I. Bagnall and Foster Transformers & Switchgear, Ltd. June 27th, 1939. (530552.)

18742. "Apparatus for the electrical precipitation of suspended particles from gases." Lodge-Cottrell, Ltd., and L. Lodge. June 27th, 1939. (530560.)

18788. "Electron discharge devices for use in television or like systems." Baird Television, Ltd., and P. W. Willans. June 28th, 1939. (530591.)

18796. "High-tension transformers."

(*Concluded on next page*)

FINANCIAL SECTION

New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares

Reports and Dividends

S. Smith & Sons (Motor Accessories), Ltd.—Presiding at the annual meeting on December 31st, Mr. W. Henderson-Cleland (chairman) said that last year he referred to the fact that the Government had requested them to reorganise the whole of their resources with a view to effecting maximum production. This they did immediately, and in a short period they reached an output far in excess of anything in their earlier history. The accounts now presented indicated that they had so far been able to maintain a sound financial position.

Dictograph Telephones, Ltd., is paying a final dividend of 2½ per cent. for the year ended August 31st last, making 7½ per cent., against 7 per cent. for 1938-39. The company's net trading profit rose from £26,091 to £32,296.

Oliver Pell Control, Ltd., announces that the payment of the preference dividend for the past half year has been deferred. The dividend on the preference shares is in arrear from July, 1939.

Greenwood & Batley, Ltd., have raised their interim ordinary dividend from 3 to 5 per cent.

Thomas de la Rue & Co., Ltd., are not declaring an interim ordinary dividend. Last year 6 per cent. was paid.

R. B. Pullin & Co., Ltd., have declared a final dividend of 15 per cent., making 20 per cent. for the year, against 25 per cent.

New Companies Registered

Eastern Electrical Co., Ltd.—Private company. Registered December 31st. Capital £1,000. Objects: to carry on the business of electrical engineers, installation contractors, wireless, television and sound engineers and service agents, etc. Directors: K. I. Rayment and Mrs. S. M. Rayment, both of "Woodrising," Queen Edith's Way, Cambridge. Registered office: 81 Hills Road, Cambridge.

Wm. Allan Smith & Co., Ltd.—Private company. Registered in Edinburgh, December 24th. Capital £10,000. Objects: To acquire the business of William Allan Smith, electrical engineer and contractor, 54, Queen Street, Edinburgh. The directors are: A. Smith, 22, Lockharton Avenue, Edinburgh, R. Limpitlaw, junior, 120, Greenbank Road, Edinburgh, and J. B. Murray, 11, North Gyle Road, Edinburgh. Registered office: 54, Queen Street, Edinburgh.

Marine Motors, Ltd.—Private company. Registered in Belfast, December 17th. Capital £1,000. Objects: To carry on the business of electricians, electrical engineers and contractors. The directors are: J. Robertson, 28, Malone Hill Park, Belfast, L. Scop, 17, Downview Avenue, Belfast, and F. A. Newell, 7, Slievemoyne Park, Belfast. Registered office: 44, May Street, Belfast.

Ancill & Co., Ltd.—Private company. Registered in Edinburgh, December 24th. Capital £1,000. Objects: To carry on the business of manufacturers of, and wholesale dealers in, optical, electrical, electro-technical and similar articles and appliances, etc. The directors are: G. C. Ancill, 9, Roxburgh Street, Glasgow, C.2, and A. Main, 25, Thornly Park Avenue, Paisley. Registered office: 10, Elmbank Street, Glasgow, C.2.

B. Cromwell & Co., Ltd.—Private company. Registered December 28th. Capital £2,000. Objects: To carry on the business of manufacturers, repairers and rebuilders of and dealers in sewing, washing, wringing, automatic and labour-saving machines (electrical or otherwise), etc. Directors: B. Cromwell, 18, Princess Avenue, Sedgley Park, Prestwich, Manchester (governing director and chairman); F. Cromwell, 34, Elm Street, Cheetham, Manchester; and P. Cromwell, 1, Mather Avenue, Sedgley Park, Prestwich, Manchester. Registered office: 57, Great Ducie Street, Strangeways, Manchester.

Fletcher & Company (Electrical Engineers), Ltd.—Private company. Registered December 30th. Capital £2,000. Objects: To acquire the business of electrical engineers carried on by F. W. Langley, Ltd. (registered office, Clough Street, Hanley), at 157, Garden Lane, Chester, as "Fletcher and Co.", and to carry on the business of electrical, wireless and general engineers, etc. The directors are: Mrs. F. E. Langley, "Radstock," Priory Road, Newcastle, Staffs; and G. H. Northover, address not stated. Solicitors: Huntbach & Son, Hanley, Stoke-on-Trent.

Companies' Returns

Statements of Capital

Chislehurst Electric Supply Co., Ltd.—Capital £50,000 in £1 shares. Return dated March 26th, 1940 (filed October 7th, 1940). 40,000 shares taken up. £30,000 paid. £10,000 considered as paid. Mortgages and charges: Nil.

Cross & Cross, Ltd.—Capital £20,000 in 20,000 shares of £1 each. Return dated June 24th, 1940. 19,775 shares taken up. £6,190 paid, being £1 per share on 5,845 shares and £1 3s. (3s. premium) on 300 shares. £13,630 considered as paid on 13,630 shares. Mortgages and charges: Nil.

Electrical & General Investment Co., Ltd.—Capital £201,500 in £60,000 ordinary stock and 141,500 ordinary shares of £1 each. Return dated July 12th, 1940. £60,000 ordinary stock taken up. £22,000 paid, being £1 per £1 stock on £20,000 and 1s. per £1 stock on £40,000. £38,000 considered as paid on £40,000 stock being 19s. per £1 stock. Mortgages and charges: £96,415.

Kalgoorlie Electric Tramways, Ltd.—Capital £250,000 in 250,000 shares of £1 each. Return dated July 24th, 1940. All shares taken up. £250,000 paid. Mortgages and charges: £62,161 9s. and interest accrued on "B" debenture stock since April 1st, 1912.

St. Helens Cable & Rubber Co., Ltd.—Capital £100,000 in 100,000 shares of £1 each. Return dated July 22nd, 1940. 84,000 shares taken up. £84,000 paid. Mortgages and charges: Nil.

J. Gledson & Co., Ltd.—Capital £15,000 in 5,000 6 per cent. cumulative preference and 10,000 ordinary shares of £1 each. Return dated July 28th, 1939 (filed August 29th, 1940). All shares taken up. £6,500 paid on 2,000 preference and 4,500 ordinary shares. £8,500 considered as paid on 5,500 ordinary and 3,000 preference. Mortgages and charges: Nil.

Richardsons Westgarth & Co. Ltd.—Capital £1,120,000 in 4,480,000 shares of 5s. Return dated September 9th. 2,451,248 shares taken up. £192,500 paid on 770,000 shares. £420,312 considered as paid on 1,681,248 shares. Mortgages and charges £478,000.

Elco (Electrical Services) Ltd.—Capital £10,000 in £1 shares. Return dated July 15th. 8,600 shares taken up, £7,400 paid. £1,200 considered as paid. Mortgages and charges: Nil.

Chadburns (Ship) Telegraph Co., Ltd.—Capital £120,000 in £60,000 ordinary stock, and 60,000 shares of £1 each. Return dated August 1st. £60,000 ordinary shares taken up. £60,000 paid. Mortgages and charges: Nil.

International General Electric Company of New York, Ltd.—Capital £100,000 in £1 shares. Return dated December 31st, 1939 (filed August 9th, 1940). 25,100 shares taken up. £25,100 paid. Mortgages and charges: Nil.

Kelvin Batteries, Ltd.—Capital £1,000 in 1,000 ordinary shares of £1 each. Return dated December 4th, 1939 (filed August 12th, 1940). 975 shares taken up, £975 paid. Mortgages and charges: Nil.

Anglo-Argentine Tramways Co., Ltd.—Capital £11,000,000 in 800,000 1st preference and 710,000 2nd preference shares of £5 each and 862,500 ordinary shares of £4 each. Return dated August 23rd, 1940. 640,000 1st preferred, 610,000 2nd preferred and 675,000 ordinary shares taken up. £850,000 paid on 20,000 1st preference and 150,000 ordinary. £8,100,000 considered as paid on 1,755,000 shares. Mortgages and charges: £70,660 annuity: £4,465,674 4 per cent. 1st debenture stock: £1,733,380 4 per cent. 2nd debenture stock and £6,000,000 4 per cent. income debenture stock.

Double Filaments, Ltd.—Capital, £250 in 250 ordinary shares of £1 each. Return dated June 30th. All shares taken up. £250 paid. Mortgages and charges: Nil.

(*Continued on page* 241)

New Patents (*Continued from page 237*)

Akt.-Ges. Brown, Boveri & Cie. June 28th, 1938. (Cognate application, 1897/39.) (530596.)

18821. "Impulse senders of the type used in telephone systems." General Electric Co., Ltd., and C. C. Puckette. June 28th, 1939. (530598.)

18842. "Electrical ignition apparatus for internal combustion engines." British Thomson-Houston Co., Ltd., K. J. R. Wilkinson and R. T. Coe. June 28th, 1939. (530601.)

18843. "Alternating current electric circuit-breakers with magnetic blowout." British Thomson-Houston Co., Ltd. June 28th, 1938. (530602.)

18846. "Methods of testing employing electric transformers." British Thomson-Houston Co., Ltd. June 28th, 1938. (530603.)

23641. "Mercury boilers." British Thomson-Houston Co., Ltd. August 17th, 1938. (Addition to 464631.) (530433.)

1940

15445. "Telephone systems." J. E. Pollak. (Associated Telephone & Telegraph Co.). May 11th, 1939. (Divided out of 530443.) (530614.)

15608. "Carrier wave receivers." L. L. de Kramolin. May 25th, 1938. (Divided out of 15467/39.) (530615.)

15609. "Apparatus for indicating the adjusted frequency of an oscillatory electric circuit." L. L. de Kramolin. May 25th, 1938. (Divided out of 15467/39.) (530616.)

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange business has been somewhat affected of late by partial interruption of the communication services. It is necessary to be without the telephone, as an example, for only one day, in order to understand the problems which this appears to pose. The opening of subscription lists for the Government's new 2½ per cent. and 3 per cent. loans has encouraged a noticeable display of strength in the prices of gilt-edged securities.

Cable and Wireless stocks remain good. Amongst equipment and manufacturing companies' shares, no outstanding feature is observable.

Government Loans' Effect

The issue of the two new classes of British Government loans, the 2½ per cent. National War Bonds and the 3 per cent. Savings Bonds, exerted a favourable influence over prices of gilt-edged stocks as a whole. By the terms of the latest-comers, the Government makes it plain that the cheap money policy is to be continued. With this assurance, capital is able to rely upon prices of this type of security being maintained for, at any rate, "duration." Therefore the War Loan and its immediate satellites are now standing at comparatively high prices. Investment stocks and shares in all markets are sympathetically affected. Electricity supply preference shares have hardened: they are becoming increasingly scarce and difficult to buy.

Home Railway Dividends

On February 16th the Home Railway companies are expected to make their dividend declarations in respect of the financial half-year which ended on December 31st last. Under the present arrangement with the Government—an arrangement which is thought may be modified not altogether in favour of the Railway Companies—the forthcoming dividend decisions are likely to be generous. It is taken for granted, for instance, that the 5 per cent. preferred stock of the Southern Railway will receive its full rate and, if it does, the yield of 11 per cent.—at the present price of 45½—looks a handsome one. To what extent the dividend outlook may be altered by a fresh arrangement between the Government and the Home Railways is the matter now in doubt. This is the reason why the stock offers so high a return on the money.

Transport "C"

London Passenger Transport senior stocks will receive, of course, the full rates to which they are entitled. Speculation is concerned with the possible dividend on the "C" stock which, in each of the past two years, received 1½ per cent. Six months ago, 15s. per cent. actual, *i.e.*, 1½ per cent. per annum, was paid. It is thought in the market that it will be repeated in February; if it is, the yield at 33 will work out at £4 11s. per cent., arguing a high degree of confidence on the part of holders of the stock as to the future outlook for its profit-earning capacity. Prices of the fixed-interest stocks in the Home Railway group, as well as those which are included amongst public boards and municipal authorities, continue to maintain their ground with undiminished firmness.

Price Fluctuations

In the overseas list, Palestine Electric "A" are up to their par level of 20s., double the price to which they fell not many months ago. Calcutta Electrics strengthened to 33s. Whitehall Electric preference have rallied to 12s. 6d. Amongst the industrial shares, British Alumium show further recovery to 41s.3d., and Telegraph Constructions to 35s. Strand Electrics at 1s. 9d. are 6d. better. Murex, at 77s. 6d., have shed their 1/16 gain of last week. Hopkinsons are a trifle easier at 38s. 3d. Cable & Wireless ordinary is 1 up at 57½. Anglo-American Telegraph preferred has changed hands at 100. The first week's business of the New Year produced no special feature of consequence apart from the strength, already mentioned, of gilt-edged securities.

Looking Backwards

Comparisons were given here last week between prices ruling at the end of 1940 and those of twelve months earlier. Considerations of space precluded the inclusion of a number of other interesting stocks and shares, and, to repair the omission, here are the fluctuations in three different sections of the markets with which these pages deal. The prices given are those at the end of December 1939 and 1940, together with net changes over the twelve months:—

Stock or Share	Dec. 1939	High 1940	Low 1940	Dec. 1940	Change on Year
PUBLIC BOARDS:					
Central Elec. 1950/70 ..	106½	110½	104	109	+2½
Central Elec. 1963/93 ..	90	96½	90	94	+4
London Elec. Trans., Ltd.	87	92	87½	93	+6
Lond. Pass. Trans. "A"	104½	116	104	109½	+5
OVERSEAS ELECTRICITY COMPANIES:					
Calcutta Elec.	31/–	37/–	22/6	33/–	+2/–
East African Power ..	23/6	25/6	19/6	20/9	–2/9
Madras	21/3	26/9	21/6	25/–	+3/9
Palestine Elec. "A" ..	23/9	25/–	10/–	20/–	–3/9
Perak Hydro-Electric ..	19/6	20/3	13/–	16/3	–3/3
Victoria Falls Power ..	67/6	75/9	56/6	70/–	+2/6
Whitehall Invt. pref. ..	14/–	17/9	8/–	12/6	–1/6

Equipment and Manufacturing

Shares in various equipment and manufacturing companies to which no reference was made last week, are as follows:—

Share	Dec. 1939	High 1940	Low 1940	Dec. 1940	Change on Year
Automatic Telephone & El.	42/6	47/3	32/–	40/–	–2/6
Crabtree (10/–)	21/3	24/9	17/6	22/6	+1/3
Elec. & Musical Ind. (10/–)	7/6	10/3	4/3	7/9	+3d.
Electric Construction ..	33/9	36/3	27/6	27/6	–6/3
Enfield Cable ord. ..	46/3	56/–	40/6	47/6	+1/3
Ericsson Tel. (5/–) ..	35/–	39/3	23/–	32/6	–2/6
Henley's (5/–)	17/6	21/6	12/6	18/9	+1/3
Lancashire Dynamo ..	55/–	59/9	47/6	47/6	–7/6
Mather & Platt	44/6	46/6	30/–	34/–	–10/6
Reyrolle	60/–	60/6	41/–	46/3	–13/9
Telegraph Construction ..	32/6	42/6	29/–	35/–	+2/6
Vickers (10/–)	16/6	22/–	9/6	15/–	–1/6
Westinghouse Brake ..	45/–	46/–	30/6	40/–	–5/–

It will be noticed that the prices at the end of last year show an irregular tendency over the period. The worst time for Stock Exchange prices in 1940 was in the middle of June when France threw in her hand. From the levels then reached, substantial recoveries have taken place in most cases.

Gas Investment in Electricity

It may seem a little strange that a gas company should be interested largely in electric lighting shares, and still more strange that it is from the income on the latter that the company looks for its main revenue under present war conditions. The Imperial Continental Gas Company has large interests in Belgium and other Continental centres, the value of which interests it is, of course, impossible to judge as things are just now. Fortunately, the company got out some of its Continental properties a little while before the war, and reinvested the money in Edmundsons Electricity Corporation shares, in which it now has a substantial stake. During the past fortnight, the Gas Company's stock has risen several points on the consideration that, although no interim dividend was declared, there may possibly be a distribution for the final half of the year through the dividends paid by Edmundsons. Moreover, according to market gossip, the I.C. Gas Company acquired its Edmundsons' shares at a price lower than that current to-day.

Parliamentary Companies

The Clyde Valley, North Metropolitan, Shropshire and the Yorkshire Electric Power companies are Parliamentary: that is to say, each is incorporated under a separate Act of Parliament. Only by consent of Parliament can any material change be made in a Parliamentary company's constitution. The Home Railway and various gas, water and a few other undertakings are established under similar conditions. As a rule, investment regards the shares of a Parliamentary company as possessing a slightly higher status than those in the non-Parliamentary group. The former are frequently permitted in trusts of a flexible nature, and this gives them a wide circle of potential public demand from buyers who rarely change an investment when once the capital is placed in it. Some companies, *e.g.*, Midland Counties, have "underlying" companies that are included in the Parliamentary class, though the former do not belong to it. And in the case of Galloway Power, South Wales Power, Kent Electric and Wessex Electric, all of which are Parliamentary, the debenture stocks only are negotiable in the Stock Exchange market, the shares being privately held.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 High-est	1940 Low-est	Dividend Pre-vious	Dividend Last	Middle Price Jan. 6	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	63/6	36/6	15	15	43/9	..	—
British Power and Light	30/-	20/-	7	7	26/-	..	5 7 8
City of London	28/-	20/-	7½	7½	21/3	..	—
Clyde Valley	38/6	24/-	8	8	33/9	..	4 14 10
County of London	43/3	21/-	10½	10½	32/6	..	6 9 4
Edmundson's:							
7% Pref.	32/-	24/3	7	7	28/3	..	4 19 1
Ord.	27/6	18/6	9	6	23/6	..	5 2 2
Elec. Dis. Yorkshire	40/3	32/-	9	9	35/-	..	5 2 9
Elec. Fin. and Securities	42/-	34/6	12½	12½	38/9	..	6 15 0
Elec. Supply Corporation	48/-	39/-	12	11½	37/-	..	6 4 4
Isle of Thanet	16/-	5/6	4	4	6/-	..	—
Lancs Light and Power	33/-	21/6	7½	7½	27/6	..	5 9 1
Llanelly Elec.	21/-	17/-	5½	5½	18/-	..	6 2 5
Lond. Assoc. Electric	21/-	12/6	7	5½	15/-	..	—
London Electric	35/-	19/-	8	7	20/-	..	7 0 0
London Power Deb. Red.	105½	100	5	5	103½	+1	4 16 6
Metropolitan	41/6	22/6	12	10	32/6	..	6 3 0
Midland Counties	39/-	23/3	8	8	32/6	..	4 18 6
Mid. Elec. Power	40/-	29/6	9	9	33/9	..	5 6 8
Newcastle Elec.	29/9	22/6	7	7	22/6	..	6 7 3
North Eastern Elec.:							
Ordinary	31/6	16/6	7	7	25/-	..	5 12 0
7% Pref.	32/6	25/6	7	7	28/9	+6d.	4 17 5
Northampton	44/-	38/-	10	10	40/-	..	5 0 0
Notting Hill 6% Pref. (£10)	10½	9	6	6	9	..	—
Northmet Power:							
Ordinary	42/3	22/6	10	10	31/3	..	—
6% Pref.	29/-	23/-	6	6	26/7	+6d.	4 9 0
Richmond Elec.	24/6	18/-	7	6	18/9	..	—
Scottish Power	38/-	24/-	8	8	33/3	..	4 16 3
Southern Areas	21/3	12/9	5	5	14/6	..	6 18 0
South London	23/3	20/-	7	7	20/-	..	7 0 0
West Devon	20/-	17/6	5	5	20/-	..	5 0 0
West Glos.	22/-	15/-	2½	4½	16/3	..	5 10 10
Yorkshire Elec.	40/-	23/6	8	8	33/9	..	4 14 10
Overseas Electricity Companies							
Atlas Elec.	4/-	1/3	Nil	Nil	1/9	..	—
Calcutta Elec.	37/-	22/6	10*	8*	33/-	+6d.	4 17 0
Cawnpore Elec.	30/-	24/-	10	10	26/3	..	7 12 4
East African Power	25/6	19/6	7	7	20/9	..	6 15 0
Jerusalem Elec.	24/-	15/-	7	7	20/-	..	7 0 0
Kalgoorlie (10/-)	12/6	9/6	7½	7½	11/6	..	6 10 5
Madras	26/9	21/6	8*	6*	25/-	..	—
Montreal Power	35½	30	1½	1½	32	..	—
Palestine Elec. "A"	25/-	10/-	5*	Nil	20/-	+½	—
Perak Hydro-electric	20/3	13/-	2½	6	16/3	..	7 7 8
Shawinigan Power	27½	19	83cts.	90cts.	19	..	—
Tokyo Elec. 6%	69	30	6	6	37	+7	16 4 4
Victoria Falls Power	75/9	56/6	15	15	70/-xd.	+9d.	4 5 9
Whitehall Investments Pref.	17/9	8/-	7½	7½	12/6	+1/6	12 0 0
Public Boards							
Central Electricity							
1950–70	110½	104	5	5	109	..	4 11 9
1955–75	112½	106	5	5	110	..	4 11 0
1951–73	107½	102	4½	4½	105	..	4 5 9
1963–93	96½	90	3½	3½	94	..	3 14 6
London Elec. Trans. Ltd.	92	87½	2½	2½	93xd.	+½	2 15 9
London & Home Counties 1955–75	115½	105	4½	4½	105½xd.	+2	4 5 4
Lond. Passenger Transport:							
A	116	104	4½	4½	109½	+½	4 2 2
B	116	102½	5	5	104	..	4 15 8
C	65¼	25	1½	1½	55	..	4 11 0
West Midland Joint Elec. 1948–68	106½	103	5	5	105½	..	4 14 9
Telegraph and Telephone							
American Tel. & Tel.	230	176	9	9	200	..	4 10 0
Anglo-Am. Tel.:							
Pref.	107	85	6	6	99	..	6 3 0
Def.	23½	18	1½	1½	23½	..	6 7 8
Anglo-Portuguese	22/6	10/-	8	8	15/-	..	10 13 4
Cable & Wireless:							
5½% Pref.	99½	66	4½	5½	93½	..	5 17 8
Ord.	65	27	4	4	57½	+1	6 19 2
Income	99½	93	..	..	98½	..	4 1 3
Canadian Marconi $1	6/-	4/-	Nil	4cts.	4/-	..	—
Globe Tel. & Tel.:							
Ord.	32/6	21/6	7½*	6*	26/3	..	4 11 5
Pref.	27/9	22/6	6	6	25/-	..	4 16 0
Great Northern Tel. (£10)	20	11	20	20	12½	..	—
Inter Tel. & Tel.	5½	2½	Nil	Nil	3	..	—
Marconi-Marine	30/-	18/3	10	7½	19/3	..	7 13 10
Oriental Telephone Ord.	2⅞	45/-	12*	11½*	2⅜	..	4 16 10
Telephone Props.	15/-	11/-	6	6	11/3	..	10 13 4
Telephone Rentals (5/-)	9/6	5/3	10	10	7/3xd.	..	6 18 0

Company	1940 High-est	1940 Low-est	Dividend Pre-vious	Dividend Last	Middle Price Jan. 6	Rise or Fall	Yield p.c. £ s. d.
Traction and Transport							
Anglo. Arg. Trams:							
First Pref. (£5)	4/3	1/-	Nil	Nil	2/-	..	—
4% Inc.	11½	2	Nil	Nil	9	..	—
British Electric Traction:							
Def. Ord.	830	400	5	45	750	..	6 4 4
Pref. Ord.	169	130	8	8	145	..	5 10 3
Bristol Trams	48/6	32/6	10	8*	37/6	..	—
Brazil Traction	12½	5½	$1	50c.	7⅞	..	—
Calcutta Trams	24/-	16/3	8	5½	19/-	..	5 15 9
Cape Elec. Trams	18/6	16/-	5	5	17/-	..	5 17 8
Lancs Transport	35/-	27/6	10	10	35/-	..	5 14 3
Mexican Light:							
1st Bonds	36	25	5	5	35	..	—
Rio 5% Bonds	95	74	5	5	85	..	5 17 8
Southern Rly.:							
5% Prefd.	79	35	5	5	45½	−1	11 0 0
5% Pref.	104½	59	5	5	83½	+1	5 19 9
T. Tilling	45/9	29/-	10	10	39/6	..	5 1 3
Tilling & B.A.	47/6	41/9	9°	8°	44/6	..	—
West Riding	35/-	25/-	10	10	34/6	+1/-	5 16 0
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	10/-	15	Nil	16/-	+1/-	—
Assoc. Elec.:							
Ord.	43/3	26/6	10	10	40/-	..	5 0 0
Pref.	36/6	32/3	8	8	35/-	..	4 11 5
Automatic Telephone & El.	47/3	32/-	12½	12½	40/-	..	6 5 0
Babcock & Wilcox	50/-	28/6	10	11	39/6	..	5 11 2
British Aluminium Ord.	56/-	29/-	12½	12½	41/3	+6d.	—
British Insulated Ord.	92/6	67/-	20	20	82/6	..	4 17 0
British Thermostat (5/-)	14/9	6/6	18½	18½	11/3	..	8 4 6
British Vacuum Cleaner (5/-)	12/-	4/9	40	12½	6/3	..	10 0 0
Brush Ord.	4/6	1/9	Nil	Nil	3/9	..	—
Callender's	69/-	46/-	15	15	62/6	..	4 16 0
Chloride Elec. Storage	72/6	55/-	15	15	60/-	..	5 0 0
Consolidated Signal	72/6	59/-	36½	17	60/-	..	5 13 4
Crabtree (10/-)	24/9	17/6	17½	17½	22/6	..	7 15 7
Crompton Parkinson:							
Ord. (5/-)	20/-	12/-	30	20	17/6	..	5 14 3
E. K. Cole (5/-)	5/-	2/6	10	Nil	4/6	..	—
Elec. & Musical Industries (10/-)	10/3	4/3	5	Nil	7/9	..	—
Electric Construction	36/3	27/6	13⅓	10	27/6	..	7 5 6
Enfield Cable Ord.	56/-	40/6	25	16¼	47/6	..	6 16 10
Electrical Switchgear (10/-)	22/6	20/-	16	10	20/-	..	5 0 0
English Electric	33/9	16/6	10	10	28/9	..	6 13 4
Ensign Lamps (5/-)	15/3	12/6	25	25	15/-	..	8 6 8
Ericsson Tel. (5/-)	39/3	23/-	25*	25*	32/6	..	—
Ever Ready	28/3	16/6	30	40	25/6	..	7 16 10
Falk Stadelmann	18/3	12/6	6	7	14/6	..	9 13 2
Ferranti Pref.	25/-	22/-	7	7	23/9	..	5 18 0
G.E.C.:							
Pref.	32/6	26/-	6½	6½	30/-	..	4 6 8
Ord.	83/3	53/3	20	20	77/-	..	5 4 0
Greenwood & Batley	25/6	20/-	15	15	20/-	..	15 0 0
Hall Telephone (10/-)	18/6	8/9	15	10	11/3	..	8 18 0
Henley's (5/-)	21/6	12/6	20	20	18/9	..	5 6 8
4½% Pref.	21/2	20/6	4½	4½	21/3	..	4 4 8
Hopkinsons	46/9	32/6	12½	15	38/3	—6d.	7 16 10
India-Rubber Pref.	21/-	19/6	5½	5½	20/-	..	5 10 0
Intl. Combustion	121/3	70/-	32½	32½	4½	..	7 17 9
J. Lucas	60/6	40/-	15	15	50/9	..	5 18 0
Johnson & Phillips	50/9	32/6	12½	15	45/-	..	6 13 4
Lancashire Dynamo	59/9	47/6	25	20	47/6	..	8 8 5
Laurence Scott (5/-)	11/-	6/-	15	15	7/-	..	10 14 2
London Elec. Wire	25/6	20/-	7½	7½	22/6	..	6 13 4
Mather & Platt	46/6	30/-	13⅓	10	34/-	—6d.	5 17 8
Metropolitan Elec. Cable Pf.	22/-	21/3	5½	5½	21/3	..	5 3 6
Murex	86/9	52/6	20	20	77/6	−½	5 3 3
Pye Deferred (5/-)	9/-	6/9	25	25	10/0	..	14 5 8
Revo (10/-)	20/9	11/6	17½	5	17/6	..	2 17 6
Reyrolle	60/6	41/-	12½	12½	46/3	..	5 8 2
Siemens Ord.	23/9	15/6	7½	7½	17/6	..	8 11 6
Strand Elec. (5/-)	2/3	9d.	4	2	1/9	+6d.	5 14 4
S. Smith (1/-)	8/-	3/6	37½	50	7/6	..	6 13 4
Switchgear & Cowans (5/-)	11/9	5/6	20	10	7/6	..	6 13 4
Telegraph Condenser (10/-)	8/9	6/3	5	..	7/6	..	—
Telegraph Construction	42/6	29/-	10	10	35/-	+1/16	5 14 6
Telephone Mfg. (5/-)	9/-	5/-	9	9	7/-	..	6 8 7
Tube Investments	96/9	59/-	23¾	23¾	92/6	..	5 4 0
Vactric (5/-)	3/6	2/-	4	Nil	2/3	..	—
Vickers (10/-)	22/-	9/6	10	10	15/-	..	6 13 4
Ward & Godstone (5/-)	19/9	12/6	20	20	13/9	..	7 5 6
Westinghouse Brake	46/-	30/6	17½	10	40/-	..	5 0 0
Walsall Conduits (4/-)	26/6	17/6	55	55	23/9	..	9 5 0
West, Allen (5/-)	7/-	3/-	7½	10	3/9	..	10 0 0

* Dividends are paid free of Income Tax.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Millbank, Westminster, London, S.W.1.

Australia. — BRISBANE. — February 6th. City Electric Light Co., Ltd. 415-V, three-phase, 50-cycle, indoor-type, metal-clad switchgear. (T.23623/40.)*

Birmingham.—January 15th. Salvage Department. 44 lead plate batteries for electric refuse vehicles. (December 27th.)

Eire.—LEITRIM.—February 7th. Board of Health and Public Assistance. Supply, delivery, and erection of three pumping units for the Carrick-on-Shannon sewerage scheme, including electric motors, and automatic switchgear. Documents may be obtained from P. H. McCarthy & Son, engineers, 26, Lower Leeson Street, Dublin, or P. J. Haugh, county engineer, The Courthouse, Carrick-on-Shannon. (Deposit: £5 5s.).

London. — FINSBURY. — January 30th. Borough Council. Two booster pumps for lifting the water supply through service tanks at two baths establishments. Particulars from the Baths Superintendent, Merlin Street Baths, London, W.C.1.

New Zealand. — WELLINGTON. — Public Works Department. January 14th. Two 3,000-kVA, 11-kV, three-phase, 50-cycle outdoor-type voltage regulating transformers and control equipment. (T.22238/40.)*

January 29th. Post and Telegraph Department. Condensers, conductor cords and headbands. (T. 23413/40.)*

Post and Telegraphs Department. February 6th. Single-core power cable. (T.23550/40.)*

Plymouth.—January 14th. Corporation. Boiler tubes and a portable coal loading conveyor. (January 3rd.)

South Africa.—PRETORIA.—February 12th. City Council. One or, alternatively two, 18,750-kW turbo-alternators and exciters, with condensing and auxiliary plant. (See this issue).

January 30th. Union Tender & Supplies Board. 200 lightning protectors. (T.23336/40.)*

January 16th. One 5-kW, 220/380-V alternator, direct-coupled to a water-cooled petrol engine. (T.23310/40.)*

February 3rd. 73 outdoor-type transformers ranging from 50 to 2,000 kVA. (T.23639/40.)*

CAPE TOWN.—January 28th. Electricity Department. Three oil-immersed single-phase 270-kVA transformers. (T.23173/40.)*

January 29th. Air conditioning plant. (T.23387/40.)*

Southern Rhodesia.—SALISBURY.—March 10th. City Electricity Department. 374 meters of various types. (T.23645/40.)*

Straits Settlements. — SINGAPORE. — January 17th. Municipal Electricity Department. 3,000 AC meters. (T.23653/40). Tenders to Peirce and Williams, Victoria Street, London, S.W.1.

Orders Placed

Berkhamsted.—U.D.C.—Accepted. Electric lighting and heating installation at five wardens' posts.—Norman Clarke.

Huddersfield. — Electricity Committee. Accepted. Renewal of air heater elements on numbers 1 and 2 high-pressure boilers at St. Andrew's Road Power Station.—James Howden & Co. (Land).

Leeds.—Electricity Committee. Accepted. Cable.—Aberdare Cables (£3,255); Crompton Parkinson (£429). Hot plates.—G.E.C.

Newcastle-on-Tyne.—Town Council. Accepted. Electrical repairs to houses.—B. Berrie.

Norwich.—Education Committee. Accepted. Electrical installation at College workshop (£2,450).—A. Park & Son.

Reigate. — Town Council. Accepted. Electric lighting installations at elementary schools (£126).—Tamplin and Makovski.

Sheffield.—Electricity Committee. Accepted. 5,000-kVA transformer (£2,751).—Metropolitan Vickers Electrical Co.

South Africa.—CAPE TOWN.—Electricity Committee. Accepted. Spare blading etc., for turbo-alternator sets (£2,110).—C. A. Parsons & Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Completion of building, for St. Paul's Church (Rev. C. Smith); J. A. Grimshaw, architect, 24, Willow Street.

Alfreton.—Buildings at the refuse works at Leabrooks, for U.D.C.: surveyor, Council Offices, Cornhill House, Alfreton.

Athlone.—Houses (10); O. Doyle, town surveyor, Town Hall, Athlone.

Barton.—Canteen, Moseley Road, for the Superheater Co.; F. E. Gill & Son, builders, Trafford Park.

Barwell.—Abattoir, High Street, for Barwell and District Co-operative Society; J. Lockley, builder, King Street.

Bebington.—Deep shelters scheme, for Town Council; borough engineer, Brackenwood, Rock Ferry.

Belper.—Two chlorinator houses, etc., for R.D.C.; A. H. S. Waters, consulting engineer, 25, Temple Row, Birmingham, 2.

Birkenhead.—Tunnel shelters, for T.C.; borough engineer, Town Hall.

Financial Section (*Continued from page 238*)

Lisbon Electric Tramways, Ltd.—Capital, £1,500,000 in 1,000,000 ordinary and 500,000 preference shares of £1 each. Return dated July 3rd. 949,757 ordinary and 425,553 preference shares taken up. £134,026 paid on 134,026 ordinary shares. £1,241,284 considered as paid on 815,731 ordinary and 425,553 preference shares. Mortgages and charges: £303,500.

Montevideo Telephone Co., Ltd.—Capital, £220,000 in 220,000 shares of £1 each. Return dated July 8th. 217,135 shares taken up. £217,135 considered as paid. Mortgages and charges: Nil.

British Electric Traction Co.,Ltd.—Capital, £2,998,397 15s. in £712,744 5s. cumulative part. preference stock, £1,326,263 10s. cumulative preferred ordinary stock, £790,752 deferred ordinary stock and £168,638 ordinary shares of £1 each. Return dated July 19th. £2,829,759 15s. taken up. £2,046,000 15s. paid. £783,752 considered as paid. Mortgages and charges: £1,642,776 9s. 9d.

Mirrlees, Bickerton & Day, Ltd.—Capital, £600,000 in 100,000 5 per cent. cumulative preference and 500,000 ordinary shares of £1 each. Return dated July 26th. 71,000 preference and 466,000 ordinary shares taken up. £302,500 paid on 71,000 preference and 231,500 ordinary shares. £234,500 considered as paid. Mortgages and charges: Nil.

Christy Brothers & Co., Ltd.—Capital, £225,000 in £75,000 preference stock and £150,000 ordinary stock. Return dated July 29th. All stock taken up. £176,083 paid. £48,917 considered as paid. Mortgages and charges: Nil.

Mortgages and Charges

General Accessories Co., Ltd., 37, Queen street, E.C.—Mortgage on 18/20, Euston Buildings, St. Pancras, N.W., factory and buildings at Barton Hill, Bristol, and the company's undertaking and other property, present and future, including uncalled capital, dated November 29th, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Jones & Lloyd (Radio-Electrical), Ltd.—Mortgage, on 907, Walsall Road, Great Barr, Birmingham, dated November 30th, 1940, to secure £760. Holder: J. White, 5, Edmund Street, Birmingham.

Power Equipment Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated December 3rd, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Receivers Appointed

Bland Light (1934), Ltd.—W. J. Austin, 56, Maxstoke Road, Wylde Green, Sutton Coldfield, was appointed receiver and manager on December 4th, 1940, under powers contained in debentures dated September 10th, 1934.

Notley Power Units, Ltd.—A. G. L. Puckle, 27, Clements Lane, E.C., was appointed receiver and manager on December 2nd, under powers contained in debenture dated May 3rd, 1940.

Liquidation

Kent Dish Washing Machine Co., Ltd.—Winding up voluntarily. Liquidator, Mr. E. Barwell.

Bankruptcies

R. Bamforth, electrical engineer, 10, West Street, Hoyland, nr. Barnsley.—Trustee, Mr. B. S. Briggs, 13, Burton Street, Wakefield, Official Receiver, released December 19th.

J. F. Creasey (Positive Electric Co.), electrical engineer, 673, Romford Road, Manor Park, E.; 6A, The Parade, Wanstead Park, and 92, Katherine Road, East Ham.—Application for discharge to be heard on January 15th at Carey Street, London, W.C.2.

Blackpool. — Additions, biscuit works, Devonshire Road; Atherton Bros. (Blackpool), Ltd., Peter Street.

Bolton.—Two community feeding centres and kitchens for T.C.; W. G. Codling, borough engineer, Town Hall.

Bradford.—Vestries and baptistry, Bradford Cathedral; Edward Maufe, architect, London.

Carlton (Notts.).—Houses (150); Trent Concrete, Ltd., builders, Colwick Netherfield.

Conisborough (near Rotherham).—Two communal feeding centres, Denaby and Conisborough, for U.D.C.; H. Thirlwall, surveyor.

Cork.—New dispensary, Cloyne, for South Cork County B. of A.; J. Hurley, secretary, Boardroom, Douglas Road, Cork.

Coventry.—Houses (896), Whoberley Estate, for T.C.; D. E. E. Gibson, city architect, 1A, Warwick Row.

Darlington.—Decontamination laundry, Haughton Road, for the T.C.; borough engineer.

Joiners' shop; borough engineer.

Extensions to church in Ravensdale Road; G. and R. Oliver, builders, 46, Kensington Gardens, Darlington.

Church extensions, Ravensdale Road; G. and R. Oliver, builders, Kensington Gardens, Darlington.

Dublin.—Reconstruction of Upper Camp administration block, and entrance blocks, Baldonnell Aerodrome; G. P. Fagan, secretary, Office of Public Works.

Durranthill.—Recreation hall and canteen for Y.M.C.A., 83, Bridge Street, Manchester; H. & J. R. Bradshaw, builders, Hill Lane, Blackley, Manchester.

Ealing.—Offices, Ealing Road; Uxbridge Valley Water Co.

Eccles.—Auxiliary fire station, for T.C.; A. V. Ridgway, town clerk, Town Hall, Eccles.

Edinburgh.—Offices for D. and J. Borthwick, East Silvermills Lane; manager.

Canteen for James H. Lamont & Co., Gylemuir Works, Corstorphine; manager.

Adaptation of four-house block, Granton-Pilton area, for school; and 64 additional school shelters (£6,000 to £7,000), for T.C.; city architect, City Chambers.

Ennerdale.—Houses (100); Ministry of Supply.

Eston.—Deep shelters; U.D.C. surveyor.

Guildford.—Alterations glass works, Portsmouth Road; Hadley Co., Ltd.

Hadleigh.—Replacement of works between Flatford and Judas Gap (£5,000) for River Stour (Essex & Suffolk) Catchment Board, 9 Queen Street, Hadleigh.

Hanley.—Alterations, Stafford Street; Cardigan Estates, Ltd.

Hawick.—School shelters (£2,000), for T.C.; burgh surveyor, Municipal Buildings, Hawick.

Inverness.—Buildings at District Asylum. —Alex. Ross and Son, architects, Inverness.

Extensions to nurses' home at Calduthel Hospital (£5,715), for T.C.; burgh surveyor, Town Hall Buildings, Inverness.

Kildare.—Reconstruction, Block No. 6, Kildare Artillery Barracks, for Commissioners of Public Works; G. P. Fagan, secretary, Office of Public Works, Dublin.

Leeds.—Completion of shops to be used as community centre at Quarry Hill for City Council (£600); city engineer.

Liverpool.—Communal dining centres on four suburban estates, for Civil Defence Emergency Committee; city architect.

Longsight.—Service depot and offices, 181-185, Dickerson Road; Hoover, Ltd., Perivale, Greenford, Middlesex.

Mallow.—Main sewerage scheme for the town (£30,606), for U.D.C.; T. J. O'Connor, consulting engineer, Dublin.

Matlock.—Water scheme (£2,825), Riber, for U.D.C.; Surveyor's Office, Town Hall, Matlock.

Middlesbrough.—Shelters, etc., at Hemlington Emergency Hospital (£4,241), for T.C.; borough engineer.

Millom.—Buildings for waterworks, including softening and filtering station, Baystone Bank Farm, for R.D.C.; Taylor and Wallin, engineers, 1, Saville Place, Newcastle-on-Tyne.

Newry.—Additions and alterations to intermediate school, Downshire Road; S. W. Reside, architect, Margaret Square, Newry.

Northenden.—Social hall and canteen, Ringway Road; H. G. Gerrard, secretary, Y.M.C.A. Divisional Offices, 83, Bridge Street, Manchester.

Oldham. — Extensions (£4,300), Westhulme Hospital for Health Committee; G. E. Hardy, borough engineer, Town Hall.

Alterations, etc. (£4,280), Westhulme Hospital, for Town Council; borough engineer.

Openshaw.—Offices for English Steel Corporation, Ltd.; W. Malthouse, Ltd., builders, Derbyshire Lane, Sheffield.

Potters Bar.—Fire station for U.D.C.; T. T. Thorpe, clerk, U.D.C. Offices, Darks Lane, Potters Bar.

Rochdale.—Cooking centre extension, with apparatus, Brownshill Open-air School, for T.C.; borough engineer.

Rossendale.—Works additions, canteen and offices, Victoria Works, Glendale Yarns, Ltd.; H. Trickett & Sons, building contractors, Turton Hollow, Crawshawbooth, Waterfoot.

Rushden.—Factory additions; John Cave & Sons, College Street.

St. Neots.—Bakehouse; W. Eayrs, Market Square.

Salford. — Alterations, Tatton Mills; Richard Haworth & Co., Ltd., Adelphi, Salford.

Feeding and community kitchen centres for T.C.; W. A. Walker, borough engineer.

Seacombe.—Alterations to works for Gandy Belt Manufacturing Co., Ltd.; J. W. Bradshaw, builder, Poulton Road, Wallasey, Cheshire.

South Shields.—Deep shelters; A. G. Richardson, acting borough engineer.

Stoke-on-Trent.—Headquarters additions, Anchor Road, Longton, for the Adderley Green Working Men's Club; secretary.

Extensions to offices; Fairfield Pottery, Hanley.

Joint clinic, Longton, for E.C.; A. Burton, city engineer, Town Hall.

Stretford.—Canteen for works, Chester Road; Fisher Renwick, Ltd.

Sunderland.—Eighteen community kitchens and feeding centres (£13,273); J. E. Lewis, borough engineer, Town Hall.

Swansea.—Gospel Hall; Rev. P. B. Williams, Southend, Mumbles.

Rebuilding warehouse, St. Mary's Square; Fred Morgan & Co., Ltd.

Offices, etc., Paxton Street; Griff, Davies & Co., Ltd.

Alterations, Rutland Street; Decorators' Supply Co., Ltd.

Teddington.—Rebuilding Baptist Church, for Baptist Union, 4, Southampton Row, W.C.1.

Tynemouth. — Schoolchildren's shelters, New York area, for E.C.; borough engineer, Howard Street, South Shields.

Urmston. — Reinstatement of houses, Stocks Terrace, Flixton Village, for U.D.C.; surveyor, Council Offices.

Wakefield.—Premises, 55, Westgate, for Martins Bank, Ltd.; Sharp and Law, builders, Carlisle Road, Bradford.

Wallasey.—Erection of kitchen at Upton Road School, Moreton, for T.C.; borough engineer, Town Hall, Wallasey.

Walsall.—Remote control electrical warning system installation (£2,500) for T.C.: also police offices, High Street, and alterations to the Council House and Town Hall (£1,050); M. E. Habershon, borough engineer, The Council House.

West Hartlepool.—Completion of additions to Sacred Heart School; borough engineer.

Yeovil.—Construction of a pumphouse and incidental works, for R.D.C.; C. A. Wilson, surveyor, 28, Kingston, Yeovil.

New Zealand Wiring Regulations

Further Prosecutions

THREE cases brought before the Electrical Wiremen's Registration Board are reported by the *New Zealand Electrical Journal*. The first was against a Waipawa firm of builders, contractors and hardware merchants who were charged with tampering with meters.

The supply authority reported that it was reported that the building occupied by a football club had been demolished. On investigation it was found that the building had been removed, the service line cut down and the meter removed. Information was received that a shop had been demolished, and it was found that the fuse on the pole at the rear of the shop had been removed, the service lines cut off the building and left lying on the ground, and the meter had been removed. It was possible for the service lines to make contact with the live distribution lines. The wires were in close proximity to the main street and could have become a source of great danger.

A fine of £1 10s. with £2 1s. costs was imposed.

A music and radio dealer of Waipukurau was charged with failing to give notice to the supply authority before beginning work. A conviction was recorded and fines and costs amounting to £3 11s. were imposed.

The supply authority reported that a radio set had been installed; it was connected up by means of two-core flex, and the receiving earth was used to earth the chassis. The dealer had been warned by letter previously in connection with an installation at another place and had had several verbal warnings, but had made no effort to comply with the Act.

In the third case a hospital patient in the same town was charged with installing electrical conductors and an accessory and was fined £2 with £1 11s. costs. It was stated that an inspection was carried out at the instigation of the Hospital Board with the object of ascertaining the condition of the appliances and general installations. In the course of the inspection a radio set was found connected up by means of a two-core flex and a bayonet type lamp-holder adaptor. The chassis was earthed with three scrap pieces of flexible cord, joined together by means of unsoldered joints and twisted round an earth-pipe without any earthing-clip. The radio set had a single-pole switch which was contrary to Wiring Regulation 55-07.